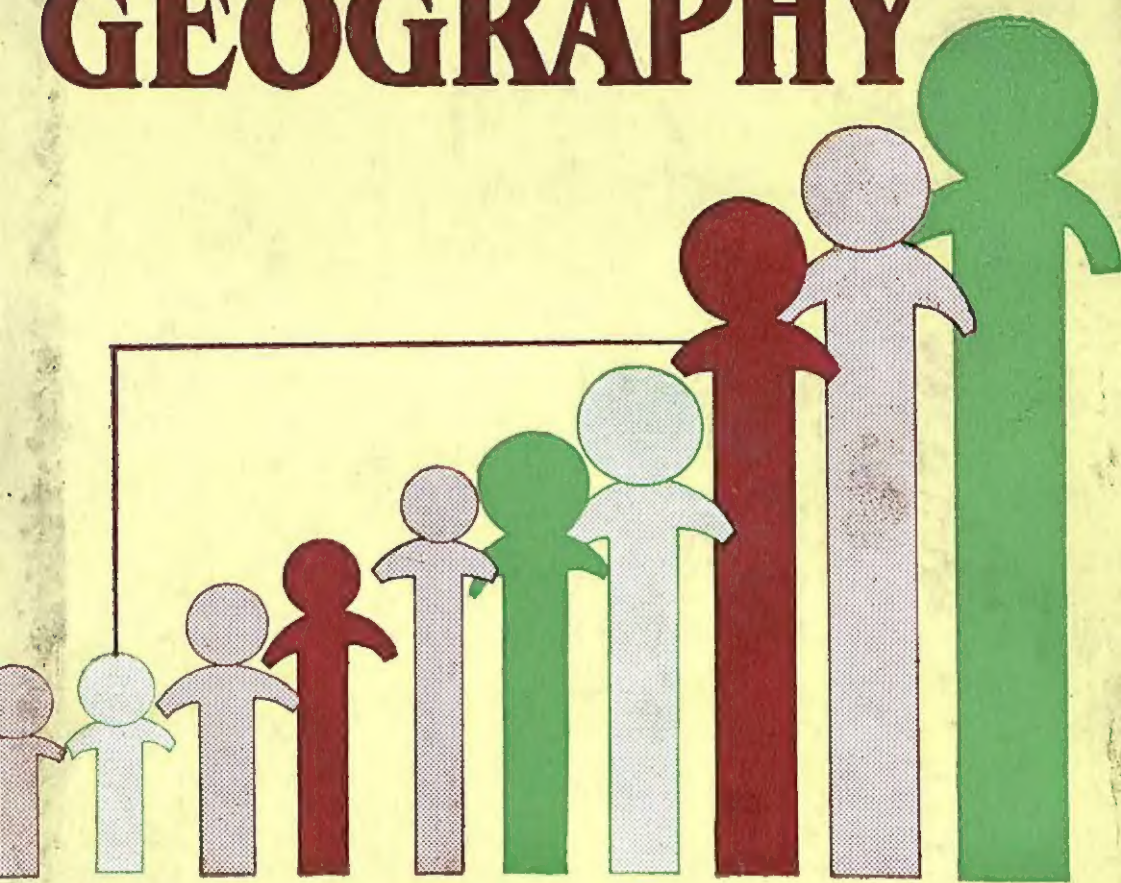# Fundamentals

of

POPULATION
GEOGRAPHY

B N Ghosh

FUNDAMENTALS OF POPULATION
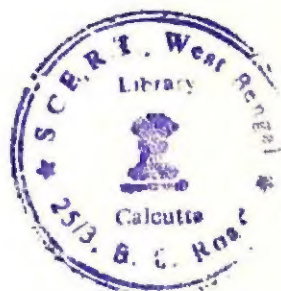## GEOGRAPHY

FUNDAMENTALS OF POPULATION GEOGRAPHY

B.N. GHOSH

Fundamentals of Population Geography
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PREFACE

Geography is a spatial science. Population Geography belongs to that borderland of geography which opens on demography, sociology and economics. Thus, the focus of the subject is essentially inter-disciplinary. At the same time, it is a very young subject; it is only thirty years old. It was in the early fifties of this century that the subject was formally proposed as a separate discipline for teaching and research by G.T. Trewartha in his presidential address to the Association of American Geographers. Since then, many universities have been offering this course to their students. But, as is natural, uniformity in the course-content of the subject has not been achieved yet and there are still many unsettled issues and areas concering the discipline. It is, therefore, a challenging venture to write a good textbook on such an emerging and fluid discipline. This is partly the reason why we do not have any textbooks worth the name in Population Geography.

The main incentive to write this book has been two-fold: lack of competent textbooks on the subject, and the recency of this discipline which requires, in a sense, a multidisciplinary approach. There is no standard textbook on the subject covering the theory, empiricism and other wide-ranging matters on the socio-economic and spatial aspects of population. The few books on Population Geography which are available in the market lack comprehensiveness, both in range and in depth. They simply discuss some basic concepts and definitions, and do not give the diagrammatic, mathematical and empirical underpinnings which are considered essential for a proper exposure to the subject. The available books are either incomplete or inadequate for use as textbooks.

The present volume seeks to fill up the information gap which exists between classroom teaching and growing academic

research. The book is written according to the latest syllabi of different universities offering this course and uses latest information and data.

The book aims at presenting a treatment of Population Geography with stress on at least six main points: (i) primary emphasis on the spatial analysis of population dynamics, (ii) socio-economic implications of population data and their bearing on human life, (iii) comprehensive analysis by means of diagrams, mathematical exposition and latest data, (iv) wide coverage of the subject, (v) thorough treatment of theoretical and empirical facts and (vi) analysis of world patterns and trends.

For facilitating comparative analysis, I have added an appendix on The Features and Trends of India's Population.

The book has many essential facets. Besides incorporating the fundamental concepts and precepts of Population Geography, it analyses at length the various recent theoretical and empirical developments in the subject. The subject of spatial population dynamics has been discussed threadbare with reference to world patterns by unfolding the separate perspectives of LDCs and DCs. Since spatial analysis is not complete without the socio-economic scenario, the book delves deep in its effort to present the socio-economic syndrome. It brings out the interactions among sociology, demography, economics and geography.

Because of its wide coverage and comprehensive treatment, the book goes far beyond the configuration of geography: it can profitably be used by the students of demography, sociology and population economics. Though it is primarily designed as a text-book, it has not been made overly pedagogical. It incorporates a good bit of the findings of recent research, and latest developments in the field.

While writing this book, I have drawn liberally from the available literature on the subject. I acknowledge my gratitude to all those authors from whose works this book has drawn material. A list of such authors' alongwith their works, is provided in the bibliography at the end of this volume. I have drawn heavily upon my articles, research papers and books published in India and abroad on various issues relating to population. In particular, I have transfused, indeed profusely,

from my books on *Population Theories and Demographic Analysis* (1977), *Economics of Brain Migration* (1982), and *A Dictionary of Demography* (1984). I have also used my papers published in *Asian Profile* (Hong Kong), *International Migration* (Geneva), *Malayan Economic Review* (Singapore), *Rivista Internazionale Di Scienze Economiche E Commerciali* (Italy), and also from various professional journals in India and abroad. I would like to place on record my gratitude to the United Nations and *The Economist* (London) from whose publications I have used material for Chapter 10 of this book.

Though I have tried my best to make the book somewhat different, I fully realise the loneliness of the error-maker.

Chandigarh   *B.N. Ghosh*

CONTENTS

INTRODUCTION TO POPULATION GEOGRAPHY

Population geography has recently emerged as a separate discipline of study and research. It is concerned mainly with the spatial analysis of population. It involves not only the magnitude of the human population but also its different characteristics, growth and mobility. It is related to other allied areas like demography, sociology, economics, and related disciplines.

Definition of Population Geography

Population geography is the spatial study of human population. It is mainly concerned with one aspect of the study of population – its spatial distribution and arrangements. In fact, population provides the essential background for all geography. Population serves as the point of reference from which all other geographic elements are observed, and from which they all, singly and collectively, derive significance and meaning. This view of G.T. Trewartha has been accepted by all geographers in modern times. In population geography, the main focus of study is the *human population*. Trewartha pointed out that the essence of population geography lay in understanding the regional differences in the people covering the earth. The central theme of the science of population geography is area differentiation. It is essential to understand the process of spatial organisation. Population constitutes the most dynamic and the central element in such a process. Clarke observed that the main task ·of population geography is to study areal variations in population and their relations with the physical, cultural and economic phenomena. Clarke lays stress on the

spatial aspect of population and distinguishes population geography from demography. In his book, *Population Geography*, published in 1965, J.I. Clarke observes that population geography is concerned with 'demonstrating how spatial variations in distribution, composition, migration and growth are related to the spatial variations in the nature of places'.

Demko does not agree with the definition of population geography as given by G.T. Trewartha. According to Demko, in spite of statements pleading for a study of dynamics, the dynamics are stressed only for understanding areal differences. However, the definition of population geography has to be formulated with reference to the nature of geography as a distinct discipline where population is the main stock-in-trade. The fact that population provides the focal point in geography, and man is not only the utilizer of physical earth but also the creator of the cultural earth, has led Trewartha to place man at the centre of the theme and thinking of geography. Trewartha's case for population geography has been accepted favourably by all geographers of the world by and large. The outcome of Trewartha's proposal is the emergence of population geography as a distinct branch of geography since the fifties of this century. With this, the emphasis has shifted considerably from the traditional regional geography to systematic geography, particularly the study of man and his relationship with the surface of the earth. However, population geography is still regarded in the USSR as a part of economic geography. But the concept of population geography in the USSR has a much wider meaning than in the West. In western countries, the concept of population geography is rather narrow; in the USSR, the concept of population geography includes study of rural and urban settlements, history of settlement, labour sources, occupation, distribution of population and so on. The most widely studied field has been that of the geography of settlement (and resettlement), in particular the geography of towns. A settlement, urban or rural, is the primary factor of observations in population geography. The mapping of population is a spatial field and has a leading place in both the technique and the practice of cartography. The analytical sections of population geography show the development and

distribution patterns of populations in all their complex relations.

According to Melezin, population geography is the study of population distribution and productive relationships existing within various population groups, the settlement network and its fitness, usefulness and effectiveness for productive goals of society. The study of population geography is identified with the analysis of territorial groupings of settled places with emphasis upon their economic functionality. This is so because the pattern of distribution of population is basically represented by a network of settlement, and changes in the settlement patterns are influenced primarily by the production processes. The basic objective of the study of population geography in the USSR is the discovery and applications of laws governing the distribution and dynamics of population, the processes affecting the settlement network, and development of settlement and associated problems. The study of individual attributes is the main subject-matter of population geography, according to Wilson.

Population geography is a systematic branch of pure geography. It lays emphasis upon regional differentiation of areas in terms of their populations. It does not study man as a phenomenon in or by itself, but as an area-characterising and area-differentiating element. Population geography is concerned with the temporal-spatial analysis of population attributes. Population geography should develop theories, explain spatial pattern and processes and should make reasonable projections regarding the main attributes of population. After all, population is the single most significant element in the study of the surface of the earth.

Madame Beaujeu-Garnier, in her book *Geography of Population*, points out that population geography is concerned with 'describing the demographic factors in their present environmental context, studying also the causes, their original characteristics and possible consequences'. Willbur Zelinsky, in his book *A Prologue to Population Geography*, defines population geography as 'the science that deals with the ways in which the geographic character of places is formed by, and in turn reacts upon, a set of population phenomena that vary

within it through both space and time as they follow their own behavioural laws, interacting with each other and with numerous non-demographic phenomena'.

Population geography is, therefore, that branch of the discipline which treats the spatial variations in demographic and non-demographic qualities of human populations, and the economic and social consequences stemming from the interaction associated with a particular set of conditions existing in a given areal unit.

Subject-Matter and Scope of Population Geography

Edward Ackerman indicates that the first set of problems in population geography involves the identification of generic relations, which includes the categorisation, classification, and differentiation procedures. The next level of inquiry involves the establishment of genetic relationships, or dynamic aspects (processes) of spatial distributions in which the temporal variable is highly significant. The last step is the determination of co-variant relations; that is, the search for understanding the space relations of spatial processes, which are expressed in terms of areal association and interaction between and among phenomena.

The main field of population geography is the areal differentiation which is helpful for solving the problems of static relationships between variables. Population study by geographers should lead to a better understanding of the processes creating areal distribution as expressed in the concepts inherent in, and by the study of spatial interaction. The study of population should consider the spatial system which arises from, or leads to the geographic character of population. Thus, the subject-matter of geography is spatial distribution and the spatial interaction of population. This will be meaningful only when carried a step further to include inquiry into the processes which influence, indeed create, particular spatial distributions and interaction.

Population geography as a formal and systematic sub-field of the discipline of geography, places greater emphasis on man. Man is the main focus of study of population geography. In addition to the inclusion of man's culture, his economic

activities, and his general distribution at present or in the past, there exists a need for better understanding of spatial aspects of population per se.

Zelinsky has stated that the scope of population geography should include a treatment of all the variables present in the census schedules of advanced nations. However, lack of uniformity among the censuses is essentially related to the composition of population, definition of workers, definition of occupation and so on. The limits imposed on population geography are likely to be determined by the cultural and economic milieu in which population geographers have to work. The cultural context has been found to be relevant in its influence on the scope of population geography. According to Hettner, population must be treated dynamically. It involves the concepts of regional birth rates, death rates, migration and so on. The geographers' focus should not be directed to the biological phenomena only. They should also consider the social qualities and the economic, political and social-psychological conditions of population. Geography should consider, on the one hand, the comparative dependence of population on natural, economic and social conditions, and, on the other hand, the contrasts in population numbers and densities in different parts of the earth. Hassinger proclaims that the dynamic element, man, is not of less importance in the cultural landscape than his works.

Geography is basically the study of regions. The concept of the region cannot be divorced from the fact that an area has reality only in terms of the specific groups of inter-related elements which comprise it, and that it can be studied only in terms of these elements which are the topical or systematic specialisations of geography. Among the various groups of elements which cause the earth regions to differ, population is important. Population is the central element around which all other elements revolve. It is from population only that other elements derive geographical significance. Thus, the study of population is the single most important approach to geography and one in which the regional concept has its broadest application. Geography of population is not the science of man; but it does include within its purview the study of man

in his reciprocal relationship to the earth. The objective of population geography is an understanding of the regional differences in the people covering the earth. Any comprehensive geographical analysis of a region should take into account the differential growth of population. According to Trewartha, numbers, densities, distributions and qualities of the population provide the essential background for all geography. Ackerman pointed out that geography treats areal differentiations, and all significant areal differentiations have a time dimension. Demographic movement is at the heart of the forces which influence the change in time and space content.

The subject-matter and scope of population geography can be delineated briefly as follows :

(i) *Study of population distribution* in all its aspects, i.e., size and spacing of settlement of units, continental and subcontinental population distribution patterns, gross patterns of distribution ecumenic and the non-ecumenic aspects, inter-temporal and inter-regional distribution.

(ii) *Density of population*, its various types, determinants and density over the regions, and world patterns.

(iii) *Spatial movement of population* (*migration*), internal migration, inter-nation migration, determinants, types, causes, consequences and laws of migration and the migration of high quality manpower from LDCs (less developed countries) to DCs.

(iv) *Growth of population*—measurement of population growth, birth and death rates, components of population growth, determinants, trend, causes, theories, and population projection.

(v) *Population composition*—ethnic composition, religious composition, linguistic composition, age and sex compositions, occupation structure, marital status, educational composition, economic composition, dependency ratio, work force, employment status, industrial classification, income and expenditure, income distribution and poverty.

(vi) *Literacy and quality of population* —literacy differentials, determinants, world pattern, quality of population, eugenic programme and practice, and methods for improving the quality of population.

(vii) *Rural and urban population*—rural-urban demographic

differentials, urbanisation process, degree determinants, world trends in urbanisation.

(viii) *Population-resources ratios*—population growth and resource development, population pressure, resource-based theories of population, optimum population, underpopulation and overpopulation, world resources-population patterns, resource-population ratios, population policy.

(ix) *A geographical overview of world population*—world population growth (trend), population projections, world migration, distribution of world population, age and sex ratios, median age of population, life-expectancy, and economic, social, cultural, health, climatic, and political indicators of world population.

The above scheme of study fits in well with the scope and subject-matter of population geography. Such a scheme is also in conformity with the one outlined by G.T. Trewartha. It should be noted that the various population attributes have to be studied in population geography both at a point of time, and also over a period of time. Thus, both inter-temporal and inter-regional analyses form part of population geography. The discipline of population geography has to make a systematic study of various attributes of population, not in isolation but as a part of the process of the various demographic phenomena occurring spatially. Clarke focused mainly on three aspects of population:

(i) Physical, social, and economic characteristics, (ii) absolute numbers, and (iii) population dynamics.

Zelinsky favours the study of those population features which are studied in censuses. Trewartha has suggested study of the past trend of population and also study of the present biological, social, cultural, and economic characteristics of population. He has suggested an exhaustive list of characteristics to be studied in population geography.

The scope of population geography can be categorised simply as the study of (i) social and cultural features of population. These features include literacy, migration, ethnic composition, caste, religion, marital status and so on, (ii) economic characteristics such as labour force occupation, income, income distribution, standard of living, poverty (relative

and absolute), surplus labour, employment status, labour absorption, labour use, efficiency and so on, and (iii) biological attributes of population, such as fertility, mortality, age, sex, race, absolute number and the like.

Relationship of Population Geography with other Disciplines

Population geography belongs to that borderland of geography which opens on economics, sociology and demography. While demography is devoted to numbers and depends heavily upon statistical methods, population geography relates numbers to area and relies on mapping. Clarke pointed out that population geography should study areal variations in population and their relationship with the physical, cultural and economic phenomena. The analysis of numbers and demographic processes for political units belongs to the area of demography.

Population geography is concerned with spatial analysis of population. It also incorporates the economic attributes of population like income, expenditure, occupation, income distribution, poverty and so on. The science of economics is basically concerned with allocation and valuation problems. It allocates the scarce resources among the competing ends. It also studies the economic behaviour of components of population as producers as well as consumers. Whereas the subject-matter of economics is the money-earning and money-spending activities of human beings, the main focus of population geography is man as an important element on the surface of the earth. Thus, both economics and population geography are inter-related and they have many common grounds of analysis. This is perhaps the reason why population geography is considered as a part of economic geography in the Soviet Union. In fact, population geography cannot remain aloof from the domain of economic analysis pertaining to population.

Population geography is also related intimately to sociology. It studies the social attributes of population such as marriage, religion, caste, literacy, family, ethnicity, household system, and so on. Thus, these two branches of knowledge are inseparable. They have obviously many common interactions.

Population geography is also related to biology. It studies the biological attributes of population, like age, sex, morbidity, health, intelligence, race and the like. A population geographer must have an intimate knowledge of biology.

However, population geography imbibes from all the connected disciplines of sociology, economics and biology, but it does not wholly depend on any individual discipline in toto. It has its special method of study and way of analysis. It analyses population with respect to space and time. This is the differentiating character of population geography which distinguishes it from other disciplines.

Sociologists, economists, physicists, and others have profitably turned their attention to distributional problems associated with depicting the structure of settlement, population agglomeration, and social function. The works of Isard in economics, of Bogue in sociology, and Stewart in physics are considered helpful contributions to the subjects which have engaged geographers for a long time. Geographers have drawn materials and insight from various related disciplines for understanding the complex problem of distribution structure of man's relation to the earth. Even geographers of the landscape school have contributed studies of indirect importance to demography through their studies of settlement. While relatively few geographers have undertaken comprehensive studies of the geography of population per se, it is safe to point out that a majority of them today will recognize a significant relationship between geography and demography. This has been evident since the end of the Second World War when the demographer began to broaden his field of study by seeking answers to population dynamics. Whereas anthropology traces the evolution of population over time, classifies races, history and studies the trend of population; population geography emphasises the spatial dimensions of population over time, or at a point of time.

History and Growth of Population Geography (Approach to Study)

Population geography was a neglected subject of study for a long time. In the past it was not a separate subject in the area of geography or spatial analysis. Population geography

was completely omitted in the past. Hartshorne, in his *The Nature of Geography*, made no reference to population geography as a systematic discipline. In the index to this volume, it is indicated that the topic of population is referred to three times in the text, but the references are incidental. In the book, *The Making of Geography*, Dickinson and Howarth have discussed the evolution of human geography without mentioning the place of population in the field. They have analysed the social, economic, historical and political geography, but population is omitted. The index provided by them does not contain the word "population". Similarly, the book, *The Spirit and Purpose of Geography*, written by Wooldridge and East has neglected the analysis of population with reference to geography. This shows that in the past population geography could not properly recognise the importance of the population element. Hettner did not single out population as a prime element for geographical study, although he recognised many other related aspects. Hettner proceeds to elevate population geography to an important position because, as he says, population has a great influence on all other geographic elements. But, although Hettner specifically recognizes the field of population geography, he does not make any serious attempt to analyse its content or method. Camille Vallaux in his essay on *Human Geography* contained in the *Encyclopedia of the Social Sciences* avoids mentioning population. In Sauer's analysis, no mention is made of any special field of population geography. Similarly, Barrows in his essay *Geography as Human Ecology*, makes no reference to population.

Although Bruhnes recognizes the geographical importance of population, he proposes to study it obliquely through the channel of habitation and settlement morphology and, as a consequence, makes little contribution to population geography. Hettner made some illuminating remarks about population but he did not elaborate them sufficiently. Hassinger did not recognize population geography as a distinct branch of the subject as Hettner did. Hassinger's analysis of man is disappointingly anthropological. Huntington and Shaw in their *Principles of Human Geography* did not make any direct reference to population.

Some amount of discussion on population is given by Pierre George of France. But, on the whole, population geography remained a subject of little importance before the fifties of the present century. The question is: if population geography is so vital a subject why was it neglected so far? The reasons for the neglect of population geography are the following:

(i) Prior to the Second World War, reliable and sufficient data on population were not available for analysis. Many countries did not start census operations. Only a few countries outside North America and Western Europe had any records relating to population.

(ii) The existing study on geography placed too much emphasis on the areal differentiations on the earth's surface. Although the earth was inhabited by men, they were neglected. Thus, the study of geography in the past was like staging "Hamlet" without the prince of Denmark.

(iii) In the past, considerable emphasis was laid on regional geography. It was considered as the core of geography.

The neglect of geography was evident in many fields of enquiry. For instance, in a survey of the publications of American geographers on population since 1925, there were only 45 titles within a period of a quarter century. The number of contributions on population geography in different journals was negligible. In many writings, population geography was given a subsidiary position, and it was made a branch of settlement geography. The population element was usually slighted in the holistic regional studies of American geographers. Secondly, much less work was being done in the area of population geography as far as doctoral dissertations were concerned. Out of a total of 343 doctoral dissertations completed in American universities up to June 1946, only 11 (a little over three per cent) were on population. Thirdly, population geography was not included in the study courses in many American institutions. An inventory of the programmes in over 20 of the largest or most distinguished departments in America

revealed that not a single department had a course dealing exclusively with population. From all this it appeared to Trewartha that population geography was systematically being neglected in the past. Till the fifties, geography was treated as a study of landscape.

For the first time, in 1953, G.T. Trewartha of the University of Wisconsin made a case for population geography as a subdivision of systematic geography in his presidential address to the Association of American Geographers. He was the first to organise and offer a full-fledged independent course on population geography at the graduate level. Many universities in the USA soon followed suit. Today, in many countries population geography is an independent discipline. There is now a growing awareness among members of the profession of the importance of population geography. Population geography in particular, and geography in general, is now recognised as a social science.

The more important question centres on the path that population geography has traversed and the methodologies adopted by its practitioners in their progress towards a better understanding of the spatial dimension of population and its attributes. However, population geography as a relatively recent and largely underdeveloped branch of geography, has not had its boundaries rigorously circumscribed. Attempts are still being made to improve the method of study and course-content of this growing discipline. It is recognised that population geography can be developed as a systematic speciality. The course-content was outlined by Trewartha, and we have earlier given the scope and subject-matter of population geography.

A significant development took place in the approach to the study of population geography during the 1950s. This made it possible for understanding the regional differences in a better way. Trewartha asserted that a *topical approach* is the best approach for understanding places and people. This approach found favour with the western geographers and, as an outcome, many studies appeared following this systematic approach.

The second approach, called the *behavioural approach*, is now being followed in the area of population geography in most countries. In this approach, the behaviour of human

beings in the decision-making process is recognised and given importance. This type of approach is followed in the analysis of migration, fertility control and so on. This approach has led to the introduction of many techniques in geographic study and research. Some of these techniques are: game theoretic approach, simulation approach, models of decision-making and the like. Recently, a *quantitative approach* was introduced in the analysis of population dynamics. However, quantification is considered a major problem in describing the space relations effect. Observational techniques need much further development if they are to match the need for quantification. A study of co-variance of the significant processes is now in the offing. Geographic study is likely to proceed on the assumption that the cultural, physical, and biotic worlds are something of a continuum for the understanding of space relations. However, disaggregative research, stressing quantification, will be most iufluential in imparting future direction to population geography.

Population geographers are also resorting to a *system approach* in cases of multi-variate relationships. In such an approach the focus is primarily on the understanding of the structure and functioning of the system. It is a *holistic process*. In the system approach, the geographers should identify the attributes and involved parameters. Then, after the structure is defined, the structural relationship may be specified in terms of some equations. In that case it becomes easy to analyse the system and make prediction. It is also necessary to understand the system both endogenously as well as exogenously so that a theoretical formulation can be made possible. It is a mechanical exercise for the study of a phenomenon. The system approach and behavioural approach to the study of population geography are not competitive but complementary in nature. The traditional systematic approach is helpful in understanding the spatial patterns of population, whereas the system approach and behavioural approach offer new ways of explanation for the implications involved in spatial patterns. Population geography is now making use of statistical methods of analysis, and it is becoming essentially more quantitative in character. It would be of immense help to population research and study

if a special quantitative method for the analysis of population geography is developed gradually by the population geographers. Such a quantitative technique may be named as *geogrametrics* and it can function in the same way as *econometrics* for economic analysis, and *psychometrics* in psychoanalysis.

Types, Sources and Problems of Population Data

Population geography is basically an empirical subject of study. As such it has to rely on empirical data for making study and projection. A population geographer has to have knowledge of different types and sources of data. He must also know the problems associated with population data from various sources. In what follows, we analyse the types, the sources and some of the problems of population data.

Types of Data

There are mainly two types of data required by population geographers. One type of data, known as *cross-section* data are collected from a cross-section of the population with respect to a particular variable or a group of variables at a point of time. The data may also be historical in character, extending over a period of time consisting of several years. Such data are called *time-series data*. Time-series data are collected with respect to a particular variable or a group of variables for a long period of time. Time-series data give a long-run perspective, whereas cross-section data give only a temporal and short-term picture of a phenomenon.

The data may be collected from a particular family, household or individual. Such data will be *micro level data* which are utilized for *micro level study*. Data may also be collected from various families and countries for the system as a whole for *macro level study*. Macro level study requires *macro level data* which are to be collected for the country as a whole for finding some useful conclusion which will have policy implications.

The data may be personally collected by the investigator through questionnaires, schedule or personal interview methods. Such a method of data collection is known as *primary method* of data collection. Statistical data may also be collected from published sources like books, reports, journals and so on,

This type of collection of data is known as the *secondary method of data collection*. Whereas the *primary data* are collected by the investigator himself from the primary sources, the *secondary data* are what have already been collected by somebody else and are available in published form. The study made by population geographers may be *aggregative* or *disaggregative* in nature and, accordingly, they have to find out the suitable data. There are mainly three sources of population data: census report, vital registration, and miscellaneous sources. These sources are briefly described below:

Census

In most countries, the population census is undertaken generally at ten-year intervals. A census is an enumeration at a specified time of individuals inhabiting a specified area, during which operation particulars are collected regarding age, sex, marital status, occupation, religion, etc. A census does not intend to count the number of people alone. It collects information on the various aspects of the population. A census of population may be defined as 'the total process of collecting, compiling and publishing demographic, economic and social data pertaining, at a specified time or times, to all persons in a country or delimited territory.'

A census is primarily an official enumeration through direct contact with all people either physically present or regularly residing in a country, or in any of its divisions. An enumeration of all persons physically present is a *de facto* census; one confined to residents like the census of the USA and its subdivision, is a *de jure* census. The main roots of population statistics hardly run back beyond the second half of the 17th century. The earliest was a municipal census of the entire population of Nuremberg taken in 1649. The honour of introducing a modern census has been claimed by several countries, notably Canada, Sweden and the USA. However, there may be special censuses for different purposes, e.g., occupation, employment, fertility, mortality and so on. There cannot be any unique method of census. A census enquiry is that in which all the items constituting the population are studied, and conclusions are drawn therefrom. In a census, the

entire universe is studied, thereby the possibility of any bias is eliminated or minimised. The data are collected in the mass. Therefore, there is every possibility of extreme items being neutralised by one another in a natural way. The law of inertia of large numbers is consistently followed. This ensures greater accuracy and correctness.

The scientific importance of the census lies mainly in the fact that it furnishes the needed basis for a study of changes in the number of people through births and deaths, immigration and emigration, and of changes in their status through marriage and divorce. Census data provide important information to the population geographers. New problems can be recognised by thoroughly studying the newly collected census data. Information regarding emigration, urbanisation, unemployment, national integration, social security, casteism, group conflict, etc. can be derived from the census data. Population projection can be made on the basis of the census report. The census is like a national stock-taking in which the rate of growth of population, sex ratio and occupations of the people are presented in full. The economic and social characteristics of the people can be known by studying the census report. Enumeration is very important in a census. There are two methods of enumeration: (i) canvasser method, or enumeration by appointed enumerators, (ii) householder method or self-enumeration. Under the canvasser method, the information is obtained by a personal interview and entered on the schedule by the officially appointed enumerators. Under the householder method, schedules are distributed beforehand to all households along with instructions on how to fill them. The schedules are filled up by the heads of households; they are collected by the officially appointed enumerators. However, sometimes a part of the schedules is filled-up by the households and the other part is filled-up by the enumerators.

Censuses are not free from defects. Firstly, because of the changes in the definitions of some terms such as urban, worker, literacy, occupation and so on, the census data of different countries cannot be compared. Secondly, boundary modification from time to time also makes the comparison of census data difficult. Thirdly, the census has not been introduced fully

in many countries. In some countries, census-taking is not regular. Even in the same country, the methods and modes of census-taking differ considerably. Fourthly, the enumerators are mostly not trained and efficient. The information collected is also mostly biased. Fifthly, the figures given by the people relating to birth, death, age and the like are grossly inaccurate, misleading and unfit for statistical analysis. In LDCs, births and deaths are not officially reported fully and accurately. Sixthly, the coverage of the census is inadequate. Many important aspects, e.g., underemployment, income, wages and the like at different periods of the year are not covered by most of the censuses.

Seventhly, statisticians and demographers are associated with census-taking. It is also necessary to associate population geographers who can give advice regarding the type of data to be used for spatial analysis of population. In view of the wide disparity among countries with regard to the census data and definitions, the United Nations has been trying to bring uniformity in the census procedures.

The fundamental deficiency of the census method for collecting vital statistics is that it can, at best, produce returns for the census year and no other. Census years are usually ten years apart. For the intercensual years, current vital statistics are not produced by the census method, and thus, that method fails in the first and minimum requisite for vital statistics, i.e., production of data on a current basis. Not only does the census method fail to provide intercensual data, it also fails to record completely the occurrence of births and deaths even for the census year.

Periodic surveys have been employed to secure ad hoc information on births and deaths in areas where the registration method has not been established, or where it is very defective. In such situations, surveys have the distinct advantage of making available some vital statistics not otherwise obtainable and of securing at the same time the corresponding population.

Sample Surveys

In the absence of the required data, the investigator may

make a sample survey with respect to a particular area in order to obtain data from the primary source. Data can be obtained through a statistical survey, also called statistical enquiry or investigation. For example, a survey can be made regarding the consumption and income patterns of the individuals of a particular locality. A statistical survey may be either a general purpose survey or a special purpose survey. In a general purpose survey we obtain data which are useful for several purposes. The best example of this type of survey is the population census taken every 10 years in India. Such a survey provides information not only about the total population but about its division into males and females, literates and illiterates, employed and unemployed, age distribution, income distribution, etc. A special purpose survey is that in which data obtained are useful in analysing a particular problem only. Surveys are essentially for a limited purpose, limited time and limited area only, whereas a census is for the entire country and is more general in nature. However, for a specific study, particularly a micro level study, surveys have become essential for the population geographers for collecting population data.

Analytical Method

The analytical method can be applied for collecting vital statistics. This method is a mathematical one based on an analysis of the returns of two consecutive censuses of population. The data from the available censuses can be used to derive information through the methods of interpolation and extrapolation regarding the approximate numbers of births, deaths, marriages, migration and so on. The indirect method yields only aggregates under certain assumptions only. This type of method is followed for finding out the vital statistics for the missing year or for making projections. Brazil, like other countries, has been following this method. It is used in those areas where statistical data are insufficient and irregular. Under this method, in order to determine the population at a time (say, t) subsequent to a census or between two censuses, one may use a number of procedures. A very common method is to make use of statistics of births, deaths, immigration

and emigration. The population P_t at time t is then obtained as :

$P_t = P_o + (B-D) + (I-E)$, where, P_t=total population at a point of time, P_o=total population recorded at last census, B=total number of births during the given period, D=total number of deaths during the given period, I=total number of immigrants, E=total number of emigrants.

Vital Registration

The registration method is the cornerstone of vital statistics. It is a continuous, permanent and compulsory method of recording vital events like birth, death, marriage and so on, in a country. It is compulsory and legal in every country to get vital events registered. Data on vital events can be obtained from the registration offices of the concerned government. In DCs, the registration is complete and its scope is very wide. However, the type of information and the quality of data obtained under this method vary from country to country. In LDCs, the system is neither complete nor wide. In India, the task has been assigned to the Registrar-General. Previously it was entrusted to the Sanitary Commissioner. In India, while some of the States have their own birth and death registration acts, some others have collected statistics in accordance with the laws and bye-laws framed by the Municipal and District Boards. These rules make registration compulsory. In the rural area, village officials like the Patwaris, and Chowkidars collect these statistics.

Miscellaneous Sources of Vital Statistics

There are many sources, both national and international, for the collection of vital data. At the national level, the following sources may be helpful:

(1) Health Service Records, (2) Live Registers of Employment Exchanges, (3) Records of Migration, (4) Statistical Abstract (published by many States), (5) Certificates of Birth, Death, and Marriage, (6) Administrative Records, (7) Records of the Ministry of Labour and Employment, (8) Records of the Ministry of Health and Family Planning-cum-Welfare, (9) Records of Labour Bureau, (10) Journals and Publications

of different universities and research organisations, (11) National Sample Survey (NSS), as in India.

At the international level, vital data may be made available from the following sources:

(i) World Health Organisation (WHO), (ii) UNESCO, (iii) World Bank Reports and Studies, (iv) Food and Agricultural Organisation (FAO), (v) International Labour Office (ILO) (vi) United Nations Publications (such as Demographic Year Book, Reports and Special Studies in Population).

Problems of Population Data

Population geographers have to face difficulties in using the population data for the purpose of research and studies. These data may have the following defects: inadequate information, insufficient coverage, biased data, changes in definitions of vital matters, lack of uniformity, and inaccuracy (possible) of the data. The data may be inaccurate owing to ignorance, bias and false statement on the part of the subjects of investigation. The investigators who have collected the data may not be properly trained and qualified. Thus, population geographers have to be very careful and cautious in using the vital data. There may also be the problem of over-enumeration or under-enumeration in many countries. The data become heterogeneous due to the changes in the definitions of the variables, changes in the boundaries, changes in the census units, changes in the connotations of the terms used, and the like. Therefore, international comparison in many cases is not possible with respect to population data. The population geographers specially face two difficulties: (1) Frequent changes in the census units and areas, and (2) lack of any definite map for showing the exact point of location of settlements. Very often, population geographers will have to resort to indirect methods for calculation of vital rates. The indirect method has to be analytical for making extra-population and interpolation with respect to population data (see *Analytical Method* in this Chapter).

Many calculations can be indirectly made with the help of sex composition data. This data is considered to be the most reliable information available in demography. Data

regarding the age-structure may be the most unreliable for many reasons. People have a tendency to hide their actual age. They very often understate their age. The population geographers can analyse the age-structure and age-groups which can neutralise the effect of mis-statement and approximations. The population geographers find that there are no standard definitions of vital elements like literacy, urbanisation, occupation and so on. This makes international comparison of these elements almost impossible. Therefore, what is required is a uniform set of definitions of all the vital terms as used in a standard census. This is perhaps one of the reasons why international studies on population problems are not coming out adequately. The necessity of standard and uniform definitions of vital terms is immediate and urgent. The task may be assigned to the United Nations. It can help the member-countries by evolving a set of uniform definitions and procedures which are required for census-taking in different countries. This will not only help the cause of research in the area of population, but will also broaden the scope of international comparison of vital statistics.

DISTRIBUTION AND DENSITY OF POPULATION

Distribution of Population

Distribution and density of population are the two funda-mental problems of population geography. This is so because distribution and density are related to all other features of population. Distribution and density of population are analyti-cally very important for population geography. These two aspects of population geography were analysed in the subject of regional geography before the introduction of population geography as a separate subject.

Definition of Distribution

Although distribution and density are quite inter-related terms, still, for analytical reasons, population geographers make a distinction between these two terms. Distribution of population refers to the way people are spaced over the surface of the earth. In other words, it emphasises the pattern of actual place-location of a population. The distribution may be linear, dispersed or agglomerated. Distribution of popula-tion will also measure the degree of population concentration or dispersion.

Significance of Distribution

Distribution of population is an aspect of population change which has become important in recent years. The changes in distribution of population in space arise mainly as a consequence of changes in the relative importance of economic activities of different regions. When an economy is dependent on manufacture and commerce, it can support

more population than when it is dependent on primitive agriculture. Changes in distribution have two kinds of demographic significance:

(1) The population of an area may have more births over deaths than that of another area and, as a result, may grow faster.

(2) People may migrate from one place to another. Therefore, the rate of growth of population in the area of immigration is raised, and the rate of growth in the area of emigration is reduced.

There may be distribution of population over the earth to secure a more satisfactory relationship between population and natural resources. The pattern of world distribution of population is not economically optimum. The distribution of population may have effect on the birth rate. In the city areas, the birth rate is not as high as it is in the rural areas. The question of distribution necessarily arises because of the fact that the population is unevenly distributed in the world. The aim of distribution is to evenly distribute population over different areas according to the economic capacity of the areas. The development of nuclear weapons has made it desirable to disperse both industries and people.

Distribution of population is of concern to all peoples, particularly when there are uneconomic concentrations of population. The states are concerned with the distribution of population between agricultural and non-agricultural sectors, between different parts of the country, and between cities and rural areas. Every social system has its own peculiar distribution of population. The population of a country may be quite differently distributed, both spatially and industrially, as in France and England. Sometimes distribution is an accident rather than the result of a definite policy. Anyway, a well thoughtout policy is required for proper distribution of population to achieve maximum social welfare. The distribution of population affects its welfare in many ways.

Distribution of World Population

In fact there has been a large element of control in the matter of distribution of population. Distribution is not a

matter of free play of economic forces. It is always managed to secure advantages to individuals or nations. Where migration is not voluntary, it is made compulsory. This has been done particularly in the Soviet Union and China. With the establishment of the Indian Union and Pakistan, many people were forced to flee from one country to the other. Local and regional re-distributions of population sometimes become urgent. For regional redistribution, formulation of a national policy is required. But there may be conflicts and disadvantages to many people, if there is a change in the distribution pattern of population within most of the urban areas. The Government of India is thinking of dispersing the population from thickly populated areas to scarcely populated areas. However, the changes in the pattern of distribution now taking place are very slow.

In 1955, the population of the world was about 2,689 million. Out of this, about 55 per cent lived in Asia, 15 per cent in Europe, 14 per cent in America, 8 per cent in Africa, 7.5 per cent in the USSR, and 0.5 per cent in Oceania. This shows an uneven pattern of distribution of world population. India has got 2.2 per cent of the world area, but she has to support 14.3 per cent of its population. Africa has got a little less than 1/5th of the world's area; but it has to support only 1/20th of its population. Over 3/4th of the earth's inhabitants are concentrated in two or three great continental clusters—South-East Asia, Western and Central Europe, Eastern and Central United States, and Canada. In Europe and America, urban occupations are more highly developed than the urban occupations in Asia. Barren lands border the Arctic Ocean. The soil is poor here and there is frost and a short growing season. In Greenland, the Tundras, Congo basin, Arabia and the Sahara and Gobi deserts, etc., the population density is very low.

The current data reveal that nearly 8 out of every 10 persons in the world live somewhere in the 25 most populous nations. More than half of the world's population lives in Asia. If the population distribution is considered from the point of view of developed and underdeveloped countries, we find that nearly 66 per cent of the world population lives in underdeveloped

and developing countries, and nearly 34 per cent lives in developed countries. In 1969, the world's population was about 3,552 million, inhabiting more than 136 million square kilometres of land. The distribution by continents is most uneven (as shown in the following chart):

	Number (millions)	Density (per sq. km.)	Percentage of world population
Africa	345	11	9.6
North America	224	10	6.4
Latin America	276	13	7.7
Asia	1,988	72	55.9
Oceania	19	2	0.5
Europe (Without USSR)	460	93	13.1
USSR	240	11	6.8
	3,552	26	100.0

Source: J.I. Clarke, *Population Geography*, Pergamon Press, 1977, p. 13.

Factors Affecting the Distribution of Population

(1) *Climate*. This is an important factor for determining the spatial distribution of population. The cold regions have the lowest population density. Cold temperature may increase respiratory diseases. In the cold regions, the growing season is very short. Similarly, an extremely hot climate is harmful; it may increase intestinal diseases. High temperature may be associated with humidity; its effect on human life is deleterious. A good climate is a precondition for human settlement. Extremely dry or cold climate is not suitable for human settlement. Thus, regions having a moderate climate have a higher density of population. The materialistic civilization is a product of physical health and mental energy imparted by good climatic environment.

(2) *Fertility of the Soil*. The quality of the soil is an important determinant of population density. Other things

remaining the same, the higher the fertility of the soil, the higher the density of the population. Lateritic tropical soils are unsuitable for improved cropping practices. Alluvial soil is the best for cultivation. The Indo-Gangetic area contains this soil. Therefore, population density is very high there.

(3) *Availability of water.* Availability of water is a precondition for higher density of population. Low rainfall restricts human settlement. The area of low rainfall is not helpful for agricultural development. The density of population decreases with a decrease in rainfall and increases with an increase in rainfall. However, the availability of water does not depend merely on rainfall or rivers, springs or lakes. There may be artificial means for supply of water. In the desert areas, population density is low because sufficient water is not available for survival of human beings, plants and animals.

(4) *Configuration of Land.* On plains, population density is higher than the population density on slopy land, mountains and hills. About three-fourths of India's population lives in the plains. It is possible to have better farming, mobility, transport and communication, etc. in the plains than on rocky lands. In the past, civilizations developed mostly in the plains. In the hilly areas, the amount of cultivable land is small, productivity is low, cost is high and physical existence is uncomfortable.

(5) *Geographical Location.* Favourable geographical location is a very important factor for higher density of population. Geographical location with respect to communication, trade and traffic, is an important criterion for economic expansion. The concentration of population in large cities is mainly due to the geographical factor of favoured location. Transportation facilities increase mobility, expand trade and commerce, and minimise the difficulties of movement. With the development of a modern transport system, urban growth is concentrating in the large cities and towns.

(6) *Availability of Power Resources.* Power resources and mineral wealth influence the concentration of population. For example, Birmingham and New Castle became great centres of human agglomeration. In India, Raniganj, Jharia, Asansol, etc. are fast developing in population because of the industries which are connected with the use of coal, iron and other raw

materials. Industrial centres are generally congested. In the regions known for coal, ironore and the like, density of population becomes high. In the UK, the distribution of population is the distribution of the mining areas of the country.

(7) *Supporting Capacity.* The means of subsistence is responsible for uneven concentration of population over the world. The higher the supporting capacity of a region, the higher is the density of population. The supporting capacity is determined by so many factors, e.g. fertility of land, productivity, natural resources and so on. Intensive agriculture can support more people than what extensive agriculture can do. The hilly tracts and deserts cannot support people. Thus, density in such areas is low. Agriculture can support more people when it is devoted to the cultivation of cereal crops rather than to the cultivation of fodder crops. The supporting capacity is also increased by the industrial and commercial pursuits. The regions where hunting, herding and other primitive occupations are prevalent, have low density of population. Technological development and development of trade and commerce are mixed together, and they influence the growth of urban centres. Technological changes can open new areas which are more helpful for human habitation.

(8) *Nature of Crop Cultivated.* The nature of crops influenes the density of population. The rice growing tracts, like Orissa, Malabar, West Bengal and the like are centres of dense population. High-yielding crops can support a high density of population. But wheat growing centres have generally low density of population, because wheat growing is suited to extensive agriculture. Rice requires far more care and laborious cultivation. The yield of rice per acre is very high as compared to the yield of other crops. Wheat with its one crop cannot support as large a population as rice can with its three possible crops a year.

(9) *Cultural and Non-geographical Factors.* In the agricultural sector, the socio-economic outlook is in favour of large families, early marriage and staying on ancestral lands. All these factors have resulted in congestion of human population in the agricultural sectors in India, Japan and China. High child-bearing capacity is sometimes glorified for

strengthening manpower and income-earning capacity. Ignorance of the techniques of family planning largely contributes to over-population.

The government's policy may encourage emigration/immigration, or may restrict emigration/immigration. Thus, government policy is a significant factor in the spatial distribution of people over the earth. On many occasions, government has changed the distribution within the country for various reasons, to use the resources, to improve military strength and security, or to achieve greater self-sufficiency. People having the same cultural affinity will generally settle at the same place. This will increase the density of population of that place.

An improved standard of living, higher cost of education, greater social security and so on will reduce the birth rate. Political forces are sometimes very strong factors for changing the distribution of population. During the Great Leap Forward Movement in China, most of the farmers were shifted from the agricultural sector. Thus, the density of population was reduced considerably.

In the matter of distribution of population, both geographical and non-geographical factors play their roles, but none of these factors is individually responsible for any change in the pattern of population distribution. In course of time, some factors loose their significance and new and complex conditions crop up which may make the problem of distribution of population acquire a state of constant flux.

Density of Population and Meaning of Density

The term 'Density of Population' refers to the number of persons per square kilometre. In other words, density of population indicates the man-land ratio. This is calculated by dividing the number of persons of a country or region by the total land area. In case the land area is small for a given population, the density will be high; but if the land area is large, then the density will be low. Density depends on many natural and human factors, such as soil, rainfall, climate, economic resources, the stage of economic growth and so on. Since these factors differ in many places, density will also differ. Density measures the degree of population concentration in a

particular area. There are many types of density of population. They are discussed below:

Types of Density

(1) *Arithmetic Density.* The number of persons per square mile or kilometre is known as simple arithmetic density. In other words, arithmetic density is nothing but the man-land ratio. In the year 1955, the man-land ratio of the world was 20 (per square kilometre). However, this type of density does not speak about the real density because it does not take into account the fact that over 70 per cent of the earth's surface is water. If only the land areas of the earth are considered, the population density becomes nearly 45 persons per square mile. However, in order to get the real picture, one should have the idea of the pattern of distribution of population. If people are dispersed widely and evenly over an area, the estimated figure for density becomes highly significant. Arithmetic density is too crude a method for measuring the concentration of life.

(2) *Economic Density.* While calculating the economic density of population, one has to keep in mind the productivity of the area under consideration. The index of population density can be realistic if it can be considered with respect to per square mile of productive land of a region. The productivity of land depends on soil, vegetation, mineral resources, climate and configuration. A piece of fertile land can support more people than a hilly track. If the productive capacity is substituted for square mile, we get a better estimate of density. This type of estimate is known as economic density. But, in reality, it is very difficult to estimate the productive capacity of an area. Economic density (ED) may be expressed by the following formula:

$$\text{Economic Density (ED)} = \frac{P_O}{P_R} \times 100$$

Where, P_O means the index of population and P_R is the index of production.

(3) *Agricultural Density.* Agricultural density means the number of agricultural people per unit of cultivable land. The

agricultural density of India is approximately 435 persons per square mile of cultivable land. The agricultural density of Japan is 1800, of Italy 234, of Germany 125, of Great Britain 49, of France 177, and of Denmark 99. Agricultural density varies from region to region in a country because of the differences in the availability of cultivable land.

(4) *Physiological* (*Nutritional*) *Density*. Physiological density substitutes arable land for total area in the man-land ratio. It omits the unproductive land from consideration. Physiological density takes into account all types of population, whereas agricultural density takes into account only the agricultural population. India's physiological density per square mile of arable land is 630. The physiological density of Holland is 2,500, Japan 4000, USA 77, Africa 35, and France 470 persons per square mile of arable land.

(5) *Critical Density* (CD). This density is proposed by Allan. He defines it as "the human carrying capacity of an area in relation to a given land-use system, expressed in terms of population per square unit of area. It is the maximum population density that a system is capable of supporting permanently in a given environment without danger to land." It can be expressed by the following formula:

$$\text{Critical Density (CD)} = 100 \ \left(\frac{C}{F}\right) \ \times \frac{A}{L}$$

Where C is the extent of cultivated area, F is the extent of fallow land, A is per capita acreage planted, and L is the percentage of land cultivable by traditional methods.

All the above types of density are subject to criticism. Firstly, the ratios are simply the averages, and may not express the real picture when a broad area is taken into account. Secondly, sometimes, the required data are not available for different political and administrative units. Thus, international comparison is almost impossible. Thirdly, the population data are available for administrative units and not for areas having homogeneous population distribution.

Because of the above limitations, the different methods cannot be used scientifically for the purpose of analysis. But

still, the concept is very useful and revealing. In fact, density, like distribution, is a function of many factors—social, economic, political, cultural and so on. One cannot explain properly these two important variables without considering the associated complicated factors.

Factors Affecting Density

The factors which affect the distribution of population are also the factors that affect density.* There are so many factors which affect the density of population. They are discussed below:

(1) *Productivity of land*. Where land is very productive, density usually becomes very high.

(2) *Soil and water*. Where the soil is not productive and sufficient supply of water is not available, density of population is low, as in Rajasthan.

(3) *Climate*. A good climate is an important factor for high density. Living conditions are comfortable for human beings in a good climate.

(4) *Rainfall*. Where rainfall is sufficient, it becomes easier to practise cultivation and to support a large number of people. Thus, density of population increases.

(5) *Economic resources*. The region having a good endowment of resources will have higher density, and the region having lower endowment of resources will have lower density.

(6) *Availability of diverse facilities*. Diverse facilities like education, amenities of life, etc. increase the density of population.

Significance of Density

If the density of population is very high, there would be abnormal pressure on land, and if the land area is not sufficiently productive, overpopulation will result. A country having higher *man-land ratio*, at the early stage of development, will have unemployment, underemployment and disguised unemployment. A higher density will indicate a lower standard of living and less mobility of labour. It will result in congestion, slums,

*See the section on *Distribution of Population*.

air pollution, scarcity in accommodation, etc. But if the natural resources are fully exploited and productivity is increased, a higher density may not lead to lower standard of living. Generally, a country having higher density is more prosperous. Higher density may be the result of advanced industrialisation. Easter Boserup has shown that when the density of population is very high, agricultural development becomes urgent and possible. In the Western countries, an agricultural revolution in the form of improved cropping pattern and practices became possible due to higher density of population.

But there is no direct correlation between density and progress, or poverty. Density gives an idea about the human resources. Apart from human resources, there are natural resources, capital stock, level of technology and so on which will determine the effects of higher or lower density on growth. If the rate of economic growth is very slow, higher density of population becomes a burden on the country. Non-economic factors, a higher density of population will ensure cultural and social intercourse within a country. Even economically, a high density of population has certain favourable effects. It will lower the per unit transport cost, and will ensure the exploitation of resources. Population, after all, is a resource. A high density of population will imply greater economic activities and an obvious urge for an improved standard of living, a greater struggle for existence and continuous competition. All these are helpful for better economic life.

World Density of Population

If we rank different countries of the world in terms of density, India falls somewhere in the middle. Its density of population is neither as high as in the Netherlands, Japan and England; nor is it as low as in the USA, USSR and Brazil. The density of population of some of the countries is shown on p. 33.

However, density of population is not a correct index of either the poverty or the prosperity of a country. The density of population of the USA is only 22, yet it is the most prosperous country. Brazil and Australia have lower densities, but they are not as developed as the USA. England has a

World Density of Population (Mid-1970)

(Per square kilometre)

Countries	Density	Countries	Density
Netherlands	319	Poland	104
Japan	288	France	93
West Germany	240	China	79
England	228	USA	22
Ceylon	191	USSR	11
Itlay	178	Brazil	11
India	164	Australia	2

Source: India: *Pocket Book of Economic Information.*

very high density, yet it is one of the most advanced countries. India's density is very high, and India is backward. The number of people that can be supported in any country depends on the availability of natural resources and the extent of the use of technology to exploit the natural resources. Japan supports a higher density of population at a higher standard of living. Therefore, there is no direct relation between the density of population and the prosperity of a country. So, nothing can be said about the economic development and the level of economic life by studying density alone. If a country is densely populated, it does not necessarily follow that it must be prosperous; and the same density does not necessarily indicate the same level of economic prosperity.

SPATIAL MOVEMENT OF POPULATION: MIGRATION

Meaning and Importance

Adam Smith remarked that of all the luggage, man is the most difficult to transport. Migration is practised from time immemorial. Migration keeps a balance between the distribution of population and the supply of natural resources. Transportation is helpful for the migration of people from one place to another. Prof. Hawley has remarked that civilised people are those people who have obtained a high degree of mobility. Migration increases mobility. Migration means change of place of living for almost a long, stable period. It implies giving up of some political boundary, however small it may be. When people leave one place and go to a new place for a temporary span of time, it is no migration from the demographic point of view. Family and individual migration has played an important role in the growth and distribution of population.

Migration is shifting of the home, and not the house. In the context of migration, we come across two processes: 'emigration' and 'immigration'. Emigration refers to going out of a country, while immigration refers to coming into a country. Thus, emigration reduces the population of a country, and immigration increases it. Migration implies the movement of people from one place to another. It is a highly selective process. It may be age-selective, occupation-selective or sex-selective. Generally, migration is male dominated, particularly in developing countries.

Migration is not merely a process of shifting people from one place to another; it is a fundamental process to change the

structure of population and it contributes a lot for the under-standing of the space-content and space-relations of a particular geographical area. Migration involves three types of changes—change in the area of out-migration, change in the area of in-migration and change in the migrants themselves. Migration is an instrument for the defusion of culture. It also serves as an instrument for the redistribution of population from one place to another. Migration reflects the changing pattern of opportunities in the affected places. For all these reasons, migration becomes an important topic of analysis for the population geographers.

History of Migration

Migration is as old an activity as civilisation. In the 12th century, a majority of students at Bologna University in Italy were foreigners. Most of these students came from European countries. In the past, many people moved from one place to another due to natural calamities. This type of migration did not constitute any problem. Migration of scientists has been taking place since 600 B.C., when scientists and scholars freely moved from one country to another. According to Brinley Thomas, in the 19th century, there was a combined movement of man and capital from the overpopulated countries to the underpopulated countries. In that century, international trans-fers of population were the most important conditions for growth.

From 1844 to 1913, emigration took place on a massive scale. People went to the newer countries from Europe. Many people went to the US because the wages for labour were high and agricultural goods were cheap. This is one of the reasons why agriculture in Europe started declining. In fact, early migratory movements were part of the peopling process of newly settled countries. During the period 1846-1932, many people migrated from British India to Africa and Oceania. These Indians and Chinese immigrants brought about the colonisation of these countries under Brititish rule. Earlier, this type of migration played a useful role to promote economic development on both sides of the Atlantic. But nowadays, such migratory movements have become a part of the colonisation

process. This only helps to develop the economy of the capitalist countries. After the Second World War many people crossed national boundaries to stay abroad permanently. From 1957 to 1967, the brain exodus from Europe to the US increased six-fold, and this seriously alarmed the West European countries. The wage level in the US is perhaps the highest in the world. This acts as a strong pull factor of migration. There is a general belief that the students who go to American universities for higher learning do not return to their countries of origin. This results in brain drain from the LDCs to the developed nations. The brain drain from the LDCs is mainly towards the developed capitalist countries, especially the USA.

Nowadays both the nature and the content of the phenomenon of international migration have considerably changed. Whereas in ancient times migration was merely a peopling process, in modern times it is not so. In the past, migration was not brain-intensive, nor was it a one-way phenomenon. The skill-content of recent migration is remarkable in the sense that only high quality manpower is involved in today's international migration. Another feature of recent migration is that it involves a uni-directional movement—from LDCs to DCs. Previously the migration process was a two-way traffic, but it is no longer so now. There is hardly any migration on a regular scale from DCs to LDCs.

Unlike migrations in the past, migration at present is constrained by a number of factors such as passports and visas and immigration and emigration rules. Historical evidence shows that students went abroad to acquire skill and knowledge, and they used to return to their home countries after completing their studies. This trend can no longer be said to be prevalent today as is shown by the fact that students who go abroad to developed countries mostly settle there. Nowadays, migration of highly skilled people is regarded as a means to exploit the poor countries by the rich countries, and is a part of the colonisation process. The problem of brain drain, which forms a decisive part of brain migration, is held to be responsible for economic backwardness, technological underdevelopment and international inequality.

Sources of Migration Data

Reliable statistical data regarding migration are not always available in many countries. There is no special arrangement to collect and regularly organise the data regarding migration in a uniform way. Moreover, there is no clearly accepted definition of migration. The data regarding international migration, however, can be made more easily available as compared to the data regarding internal migration. There are two methods, generally, to get the data regarding migration: (i) Direct method, and (ii) Indirect method.

By the direct method we can calculate the number of people who migrate. This calculation may be based upon two methods. Firstly, we can know the number of people migrating by studying the documents which are prepared at the time of migration. Secondly, on the basis of census data we can know the number of people who have migrated.

According to the indirect method, we can know the extent of migration by studying the data relating to the places of birth. Generally, every country collects the data regarding the original place of people. On the basis of data regarding the place of birth, we can have an idea about the extent of migration.

Types of Migration

There are two types of migration: (i) International migration, and (ii) Internal migration.

International migration is migration from one political boundary to another political boundary. It depends on the laws regarding migration of the two countries. Internal migration is migration from one place to another within the same country. Internal migration may be divided into the following four types:

(a) Migration from the village to the city,
(b) Migration from one village to another village,
(c) Migration from one city to another city, and
(d) Migration from the city to the village.

According to Kingsley Davis, internal migration is more important than international migration from the point of view

of demography. In the case of internal migration, there are less restrictions on individuals, resources and capital. Therefore, internal migration is more frequent than international migration. The distance involved in internal migration may sometimes be greater than that involved in international migration. During the Sino-Japanese War (1939-45), lakhs of Chinese left the eastern sea-side and went towards the interior of the country. During the period of this great internal migration, there was large scale social change in China. Similar important internal migration took place in America when people in large numbers migrated towards the western side of the country. International migration is based on some legal control and regulation, but in the case of internal migration, there is no such control on the movement of population. Therefore, internal migration is practically more important.

Internal migration may be divided into the following two types on the basis of the advantage of the migration:

(i) *Inter-regional migration.* This involves migration from one region to another.

(ii) *Migration from village to city.* Village people come to city areas for education, for white-collar jobs, and so on.

Determinants of Migration

The factors influencing the decision to migrate are complex in nature. Since migration is a selective process affecting individuals and which contains social, economic, educational and demographic characteristics, the relative influence of economic and non-economic factors may vary not only between nations and regions but also within defined geographic areas and populations. The following factors influence the migration decision:

(1) *Social Factors.* These factors will include social obligation, marriage, cultural change, the desire of migrants to break away from traditional constraints of social organizations, the desire for a new social system and dislike for the existing social norms.

(2) *Demographic Factors.* These factors will include a very high man-land ratio, pressure of population, unemployment and underemployment and the lack of alternative openings. They

also include reduction in mortality rates and the concomitant high rates of rural population growth. People from high density areas will try to migrate to the low density areas where demographic pressure is low.

(3) *Physical Factors.* These factors will include climate and disasters like floods and droughts.

(4) *Communication Factors.* These result from improved transportation, a better education system, modernised area and system, and better contacts.

(5) *Cultural Factors.* The old culture might be abandoned for what is regarded as a better culture. The bright city light and permissive society will attract the young migrants.

The abovementioned non-economic factors are no doubt relevant for migration. But the importance of economic factors can hardly be exaggerated. The economic motive is the dominant motive for migration. People migrate to better places in search of better living. The search for better economic opportunities has been the dominant motive both among international migrants and internal migrants. The forced type of migrants find their motives in the desire and ambitions of the political leaders. In the totalitarian states, people are forced to move from one place to another. However, the motive for migration may also be non-economic. The desire to secure freedom from political oppression, the desire for religious freedom, personal maladjustments to family and community life, and the like. Military and national considerations also play their parts in the movement of large numbers of people from one place to another. Sometimes, for migration, the dominant group forces the weaker group.

Migration is inspired by the differences in expected rather than actual earnings between two places (old place of out-migration and new place of in-migration). The migrant wants to maximize his expected gains from migration. Expected gains are measured by the difference in real incomes between the old place and the new place, and the probability of a new migrant obtaining a job in the new sector. The migrant will compare his expected income for a given time horizon in the new sector with the prevailing average income in the old sector. Migration will take place if the former exceeds the latter. The migrant must

balance the probabilities and risks of being unemployed or underemployed for a considerable period of time. If the probability of obtaining a job in the new area is very low, the migration will not take place within the limited time horizon. But if the probability of success in obtaining a job is very bright, the migration will take place. However, the migration decision may be based on a longer time horizon, and a more permanent income calculation. If the migrant expects a relatively low probability of finding regular wage employment in the initial period, but expects this probability to increase over time as he is able to broaden his new contacts, it would still be rational for him to migrate even though the expected income in the new place during the initial period may be lower than the expected old income. As long as the present value of the net stream of expected income in the new sector over the migrant's planning horizon exceeds that of the expected old income, the decision to migrate is justifiable. Since expected incomes are defined in terms of both wages and employment probabilities, it is possible to have continued migration in spite of the existence of sizable rates of unemployment in the new sector. To sum up, a Todaro-type migration model will have the following four basic features:

(i) Migration is stimulated primarily by rational economic considerations of relative benefits and costs, mostly financial but also psychological.

(ii) The decision to migrate depends on expected rather than actual new-old real wage differentials where the expected differential is determined by the interaction of two variables, the actual new-old wage differential and the probability of successfully obtaining employment in the new sector.

(iii) The probability of obtaining a job in the new sector is inversely related to the unemployment rate in the new sector.

(iv) Migration rates in excess of new job opportunity growth rates are not only possible but rational and even likely in the face of wide new-old expected income differentials. High rates of unemployment in the new

sector are therefore inevitable outcomes of the serious imbalance of economic opportunities between new and old areas of most underdeveloped countries.

Migration takes place if the benefit of migration exceeds the cost of migration. Like the benefit, the cost of migration will consist of money cost, and non-money cost including opportunity cost and psychic cost. The opportunity cost is the present value of the stream of the expected real earnings in the country of origin that the migrant forgoes if he migrates to another country. The psychic cost is the unknown cost arising out of the new environment, new place and new set-up.

Similarly, the benefits can be pecuniary and non-pecuniary. The pecuniary benefits are the expected net money earnings. But the money earnings must take into account the price level prevailing in the country of immigration. In other words, it is better to consider net real pecuniary benefits. It is also important to consider the non-pecuniary benefits that may be available in the country of immigration. These benefits may be psychic, e.g., better facilities, prestige and so on. The non-pecuniary benefits may or may not be expressed in monetary terms.

As is evident, an individual migrant wants to maximise the present value of his net real income. If the present value of the sum of the streams of expected real income to a prospective migrant is greater than or equal to the present value of the sum of the streams of expected real costs of migration to a new country, the emigration will occur. It should, however, be noted that in spite of positive benefit-cost differential, migration does not take place. This is because the effect of wage differential between the new and the old areas is more than offset by the non-wage considerations and motivations. But the wage differential remains essentially an important factor. There are two main factors in migration—the pull factor and the push factor. When people are attracted by the advantages of the new place, the benefits are regarded as the pull factors. But when people want to save themselves from the restrictions and disadvantages of the existing place of living, the factors are called the push factors. Some of the important push-pull factors are given as follows:

Push Factors	Pull Factors
1. Unemployment and under-employment.	Better economic prospects.
2. Economic underdevelopment.	Higher salary and income.
3. Low wage and salary.	Better level of living and way of life.
4. Political instability.	Better research facilities.
5. Overproduction and under-utilisation of talented people.	Modern educational system and better opportunity for higher qualifications.
6. Lack of research and other facilities.	Prestige of foreign training and education.
7. Lack of freedom.	Intellectual freedom.
8. Discrimination in appointment and promotion.	Better working conditions and better employment opportunities.
9. Discrimination based on religion and politics.	No discrimination.
10. Poor working facilities.	Relative political stability.
11. Lack of scientific tradition and culture.	Presence of a rich, scientific and cultural tradition.
12. Unsuitable institution.	Attraction of urban centres.
13. Desire for a better urban life.	Availability of experienced supporting staff.
14. Desire for higher qualification and recognition.	Frequent chances of a lucky break in life.
15. Better career expectation.	Technological gap.
16. Lack of satisfactory working conditions.	Allocation of substantial funds for research.
17. High man-land ratio.	Low-density of population and better housing and medical facilities.
18. Existence of surplus labour.	Increasing demand for labour and skill.

Factors Discouraging Migration

People generally do not like to leave their original place of residence. They become part and parcel of the culture, language, religion, environment, social customs and traditions of the place where they live. They do not like to part with all these things. People have to face many difficulties in migrating from one place to another. They have to adjust themselves to the environment of the new place. Therefore, economic factors alone do not induce people to migrate. Along with the economic factors, people have to consider so many other things while migrating from one place to another. The following are the factors which discourage migration:

(i) *Distance.* Distance is a discouraging factor for migration. The greater the distance, the lesser would be the possibility of migration.

(ii) *Uncertainty about income and employment.* Uncertainty regarding income and employment will discourage migration; more so, if the transportation expenses are high, the possibility of getting good accommodation is remote, and the living conditions are not up to the mark at the new place.

(iii) *Attachment to old place of living.* While living at a place, people may be attached specially to that particular place or to the jobs they are doing. Therefore, greater attachment to the old places and things will be a discouraging factor for migration.

(iv) *Differences in language, culture, social customs and traditions.* The language, customs and traditions of the new place may not be liked by the migrants. In such a case, people will not try to migrate to a new place.

(v) *Double establishment expenditure.* Sometimes, a man may migrate to a new place in connection with a new job. But he may have his property and family at the old place of living. In that case, he will incur additional expenditure for maintaining double establishments. Difficulties in the way of education of the children may also be a discouraging factor for migration.

(vi) *State Regulation.* There is no state regulation normally for internal migration. But, for international migration, there is state regulation. One has to take the permission from the state to migrate to other countries. Sometimes, the state may

not allow its citizens to leave the country. Thus, migration is discouraged by state regulation and control not only of the country wherefrom people are migrating but also of the country to which people are trying to migrate.

Prof. Myrdal believes that emigration and immigration will not significantly influence the future size of population in any of the South Asian countries. After World War I, many countries restricted immigration from abroad. Immigration policies in the Communistic countries are extremely nationalistic. Some countries have colour prejudice. In some other countries (e.g., Sri Lanka), the serious minority problems growing out of earlier immigrations are a barrier to any further influx from the neighbouring countries.

Laws of Migration

The decision to migrate is the outcome of human psychology and behaviour. Human behaviour cannot be subjected to any universal and uniform law. However, many studies and models relating to migration have tried to find out some pattern and order in the migration decisions of individuals. In recent years many models have been presented by geographers, economists and sociologists. In this connection, one can cite the names of Bunge, Lee, Petersen, Gale, Rossi, Wolpert, Gould and Prothero, Pryor, Todaro, Sen, Ravenstein and so on. However, Humphreys has rightly pointed out that migration is rather distinguished for its lawlessness than for any definite laws. From the many models the studies put forward on migration, one can cull out some basic laws or behaviour patterns. Thus, Reilly observed that the movement of persons between two urban centres will be proportional to the product of their population and inversely proportional to the square of the distance between them. This is known as the *gravity model of migration*. It was the first attempt to give a cross-section of a macro-level interaction in a system of regions which were theoretically stationary with respect to time, direction and space. The model propagated that it is the economic base of a country which is fundamentally important for attracting the migrants.

Zipf formulated the *Principle of Least Effort* which points

out that the lesser the effort, the greater is the desire to migrate. The effort includes, among other things, the distance involved in migration. In other words, the greater the distance, the greater is the effort required to overcome the difficulty, and therefore, the smaller is the number of migrants. Stouffer introduced the *Principle of Opportunities* which says that the number of persons moving to an area is directly proportional to the number of available opportunities there, and inversely proportional to the number of intervening opportunities (opportunities on the way). Later on, Stouffer introduced in his hypothesis the concept of competing migrants. Thus, migration is an inverse function of not only the intervening opportunities, but also the competing migrants for the same opportunities. Hagerstrand emphasised the importance of the *personal information field.* Wolpert stressed the individual utility functions for the migration decision. A.K. Sen, on the other hand, compares the utility of income in the old sector with that of the income of the probable job in the new sector. He has pointed out that non-economic factors can very well influence the migration decision.

Ravenstein formulated certain laws as early as 1885 regarding migration. His basic laws are given below:

(i) Long distance migrants have a preference for large centres of commerce and industry.

(ii) The number of migrants to a place decreases as the distance increases.

(iii) The process of dispersion is the inverse of absorption.

(iv) Migration takes place in currents.

(v) An increase in the level of technology also increases the magnitude of migration.

(vi) The gaps left by the migrants in the rural areas surrounding an industrial centre are filled up by migrants from other remote districts.

(vii) Each main current of migration produces a compensating counter-stream.

(viii) The natives of the towns are less migratory than those of the countryside.

  (ix) Females appear to predominate among short-journey migrants.

Considered from the point of view of modern migration, many of the laws enunciated by Ravenstein do not seem to be correct, particularly the laws numbering six to nine (vi to ix as above). However, he is credited with having formulated some basic laws regarding migration for the first time in history, which started further research in this field of study.

Consequences of Migration

Migration will have varying consequences on the old and new areas of migration, and also on the migrants themselves. Migration will alter the resource-population ratio in the places affected. The socio-economic set-up of the two places is also affected by migration considerably at times. Migration will have its impact on the fertility, mortality, age-structure and sex ratios of population. It will also change the economic and religious composition of the population. Migration is supposed to change the dynamics of population—like density, occupations, openings and so on. It may also create ecological imbalance, pollution, housing problems and many other socio-economic problems. Some of the important sequences of migration are listed below:

(1) Migration to a new place requires social and personal adjustments which may be difficult to a new environment because of differences in cultural patterns. Due to maladjustments, there may be instability in conduct leading to crime, lawlessness and mutual antagonism.

(2) The new kind of life may disturb the family relationship and office relationship of the migrant. The traditional pattern of living may also be hampered. It may lead to a high degree of undisciplined individualism. A large proportion of the migrants may experience change in their modes of living.

(3) Migration may make an orderly mental development very difficult and sometimes impossible. The migrants live without the guidance of settled habits and attitudes of mind. Thus, their personalities are disorganised.

(4) However, the migrants may feel some social and economic freedom as well. They may improve the economic aspect of their lives. From the economic standpoint, the individuals are generally benefited by migration.

(5) Migration will reduce the pressure of population of the area from which the migration takes place; and it will increase the pressure of population on the new area where people have migrated.

(6) Migration from a particular area may lead to a massive brain drain. Generally, the best people of the country migrate to advanced countries. This implies the emigration of the brain resources from a country. This is certainly bad for a country wherefrom migration takes place. Nowadays, brain drain has become a problem in less-developed countries.

(7) A country having immigration of population may have to face different problems. It will now have heterogeneous population leading to cultural differences. Some people observe that only a highly homogeneous group can produce a civilization of high order. However, there would be the problem of integration of different cultural patterns. But immigration retards the integration of the life of all classes, and to that extent, it puts an obstacle before the achievement of many of the higher human values.

(8) International migration may be accompanied by racial differences. So, race conflicts will become more bitter in the long run. Many countries sustain racial prejudice; and migration to such countries will lead to racial antagonism.

Migration and Population Growth

Walker pointed out that birth declined most rapidly in those parts of the country where immigrants were most numerous. The reason for this decline in birth rate is the unwillingness on the part of the natives to have their children compete economically with foreigners. With immigration, the natives pass on the laborious tasks to the foreigners, while

they themselves (the natives) want to enjoy a better standard of living. As a consequence, the birth rate is reduced.

Quick industrialisation and urbanisation are made possible by the help of poorly paid immigrants. Industrialisation and urbanisation help to reduce the birth rate. Industrialisation is helped by an abundant and cheap labour supply made possible by the immigration. But it is not certain that immigration always leads to quicker industrialisation. With immigration, however, the natives take up better-paid urban jobs where limitation of the family size becomes essential. Immigration may not lead to any net gain in numbers over what the country would have had, if the process of industrialisation would have been slower.

According to some, the population growth of a country is not much affected by emigration. This was the position of Italy upto World War I. Therefore, a country does not get much relief if a certain number of people migrate from there. However, large emigration may have some impact in slowing down the rate of growth of population. In Germany, the rate of population increase was lower in the periods of large emigration than in the period of smaller emigration. But it is not certain that the number of emigrants was the only important factor affecting population growth. The effects of emigration are closely associated with other social and economic conditions affecting population growth.

It is impossible to determine the effects of migration on the population growth of the sending country. If there is a high birth rate, and a high death rate in a country, emigration will not considerably change the rate of growth of population in the sending country. A large emigration may lower the death rate. Thus, the rate of natural increase in population would be raised. The birth rate is not generally affected by emigration. However, if a large number of young women emigrate, the birth rate may decline a little.

However, emigration is not always possible. The lands available for emigration are not sufficient today. Thus, the possibility of international migration is very bleak. Emigration will not help a country much if it has a very high birth rate and a very high death rate. An area having a relatively low

birth rate and death rate may be to some extent benefited by emigration, if it is on a large scale. In such a case, the death rate would be raised a little, and the birth rate would be reduced a little, thereby reducing the natural increase in population a little. The birth rate would be reduced by the emigration of young men and women, and the death rate would be raised because of the proportional increase of the older people in the population. However, countries having low birth rate and death rate seldom send out emigrants. Where conception control is widely practised, emigration may quicken the adjustment of numbers to the changing economic situation due to the vagaries of foreign trade.

When the people of more advanced culture immigrate to a new land, the population is very much increased. The population of USA, Canada, Austria, etc. is much greater than what it would have been if no European had entered these areas. According to Prof. Thompson, during the last 300 years, most immigrants settled in the new areas, and the surroundings have been favourable to a high birth rate and a low death rate, so that the population increased rapidly.

Migration as a substitute for birth control

Migration may be regarded as a substitute for birth control. The effect of emigration on population growth depends on the age and sex distribution of the emigrants. If they are newly-born and have the same sex ratio as other newly-born children, emigration will have the same demographic effects in the short-run and in the long-run as decline in the number of births due to the spread of birth control. However, if the comparison is between birth control and emigrated population that has the same age and sex distribution as the actual population, birth control would be better than emigration because birth control will make the age distribution more favourable. However, it is better to emigrate the young adults or newly married couples. Emigration will decrease the adverse economic effects that are related to the increase in the labour force. Emigration is generally selective with respect to sex and age. This means that emigration is a costly way of bringing down population growth. The cost of emigration is greater than the cost of birth control.

Migration within the country leads to reallocation of population according to the natural resources. This may offset partly the bad effects of emigration as compared with birth control.

When the most enterprising, better trained and educated people emigrate to foreign countries, the harmful effects on economic development will more than offset the benefits from a lower rate of growth of population. Internal migration may have favourable effects on the quality of the population of the area where the immigration has occurred.

Internal migration

Internal migration may be of different types. Firstly, there may be marginal and dispersed movement of population seeking better economic opportunities. Secondly, there may be migration towards the cities. Another type of internal migration involves refugees fleeing from local military actions or from clashes between ethnic or religious groups. People may flee to cities which give them better protection. The most important type of internal migration consists of the movement of population from densely to sparsely populated areas. There are opportunities for resettlement of population in Indonesia, Vietnam, Ceylon, Philippines, India, Pakistan and a few countries of South Asia.

However, the causes of internal migration are not essentially different from those of international migration. Non-economic factors play a more important role in internal migration. The movement generally is from the agricultural sector to the non-agricultural sector. When the agricultural sector develops, a lesser number of workers is required for carrying out agricultural works. Thus, more labourers have to be transferred to the non-agricultural sector. The rural areas have always been the chief sources of internal migrants.

Factors determining and affecting internal migration

The volume and the direction of migration are determined by the economic differences between the areas. People generally move from low-earning areas to high-earning areas. People may migrate from unproductive areas, areas having high pressure of population, and from areas where job opportunities

are not sufficient. The net movement out of, or into, any area will depend on the nature and strength of the push and pull forces. The uncertain economic condition and bleak economic prospect may act as great push factors, while industrialisation in the city areas may act as pull factors. The factors affecting internal migration may be discussed below:

1. *Abnormal Pressure of Population on Land.* Abnormal pressure of population on land compels people to migrate to other areas. Excessive pressure on land leads to uneconomic holdings, poverty, underemployment, disguised unemployment, indebtedness and so on. Therefore, people try to emigrate.

2. *Industrialisation.* Industrialisation is an encouraging factor for internal migration. It leads to the establishment of different industries and projects. During the period of industrialisation cottage and handicrafts have relatively less importance. Therefore, the people who are in search of jobs may migrate to the city areas where the tempo of industrialisation is generally high.

3. *Better Transport and Communication Facilities.* Improvement of transport and communication facilities encourages movement from village to city and form city to village. Since the transportation facilities are easily available, people are encouraged to move from one place to another.

4. *Joint-family System.* The joint-family system is an advantage for internal migration. In a joint-family system, some of the members may easily migrate to other areas in search of better jobs or education. They are not worried because their families are looked after properly in the joint-family system.

5. *Indebtedness and Poor Economic Conditions.* Indebtedness and poor economic conditions induce people to leave the village in search of better-paid occupations so that they can earn sufficient money to pay off the debt and to better their economic condition.

6. *Social Conditions.* In certain areas, social conditions are not favourable for free living. Untouchability, class antagonism, personal conflict and the like may induce people to leave such societies. In cities, social evils affecting personal freedom are comparatively less. Therefore, the people are attracted towards cities.

7. *Family Trouble.* There may be conflict among the members in the same family. Some members of the family may migrate to towns for avoiding conflict and antagonism.

8. *Marriage.* Marriage is a great force favouring internal migration. After marriage, the wives accompany their husbands. Thus, the wives have to migrate to new places.

9. *The Attraction of Cities.* Cities have great attraction for the people of the non-city areas. Cities provide better facilities for education, employment, living and the like. Therefore, the villagers are easily attracted by the way of life in the cities.

10. *Economic Conditions.* Economics is a great force for internal migration. During the time of economic difficulties, people migrate to a place where there is economic prosperity.

11. *Geographical Factor.* If an area does not have conducive climate, sufficient drinking water and transport facilities, the people cannot live there for a long time. Sooner or later, they try to migrate from that place to a better place.

12. *Political Factor.* The political factor influences internal migration. The government may redistribute population from thickly populated areas to sparsely populated areas. Internal migration may be government-sponsored, as in China and Russia.

13. *Service and Transfers.* When people get jobs in a new area, they settle there. People in government service or even in private service may be transferred to new places where they may settle.

Some characteristics of migrants

In rural-urban migration, it is observed that the brighter and more energetic boys and girls leave the rural areas and move to cities. It requires more than an average amount of energy and initiative to cut off home ties and move into unknown environments. Internal migrants have better hereditary qualities.

The sex ratio of the migrants is generally very low. More males migrate to unknown places. Unmarried girls generally do not move into unknown environments. When people migrate from urban to rural areas, the sex ratio becomes

generally high, because the males are left in the city, as they are in regular services.

The migrants are generally in the age-group 15-35, with proportionally more females under 20, and more males over 35. Old people show little tendency to migrate. The migrants are more educated than non-migrants. People with good education can expect to get openings in cities. Therefore, educated people have a high rate of migration. In underdeveloped countries, young people having school education migrate to cities in search of white-collar jobs.

White-collar workers are much more mobile than manual labourers. The higher the social status of the white-collar workers, the more mobile they are. People from villages are attracted to the low-paid occupations in the city areas. They have low wages and salary incomes. The young people who have received some amount of education look down upon farm jobs and manual labour. They are unable to cope with the strains of the occupations in the rural areas. They want to avoid the drudgery of the rural occupations and therefore hope for a lucky break, which is possible more in the cities than in the rural areas.

International migration of high quality manpower—brain migration

Brain migration from less-developed countries (LDCs) has considerably increased in recent years. It is characterised by a one-way migration of talents on a massive scale in a systematic manner. The problem is of recent origin. It has become very crucial since the post-Second World War days. In this process of peculiar international migration, the brain receiving countries become the gainers, but the brain-sending countries remain the net losers. Hence, brain migration, particularly brain drain, manifests itself as a problem before the LDCs.

Brain migration is not a single malady. It encompasses various categories of migration of skilled people from LDCs. It is not proper, therefore, to analyse brain migration as a singular problem. As a phenomenon, it varies from place to place and from time to time. The problem is multi-dimensional. Migration of high quality manpower (HQM) justifies the use

of the term 'brain', but it is preposterous to indiscriminately use the term 'drain' in every case. It is analytically essential to identify every type of brain migration. There are the following four main types of brain migration: brain drain, brain overflow, brain export, brain exchange:

Brain Migration

Brain Drain	Brain Overflow	Brain Exchange	Brain Export
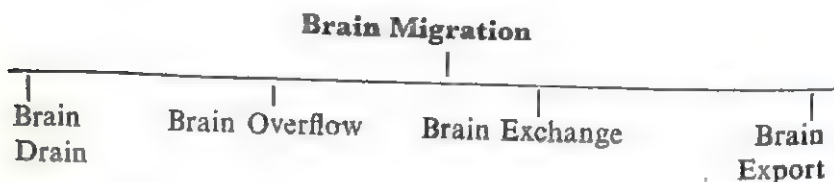
Brain Drain

Brain drain refers to loss of high quality manpower which was productively employed in the country of origin. The country of origin requires such manpower for the all-round development of the economy, but such manpower is generally lured away by advanced capitalist countries without paying any compensation to the brain-sending country. The brain, of course, receives its private price from the brain-receiving country, but the public cost incurred on the brain is never realised. The country affected by drain problem incurs economic and social losses, both in the present and in the future.

Brain drain is caused by many factors such as low domestic income, discrimination, inadequate facilities for research and studies, underemployment, lack of promotion, lack of any future prospect in the domestic economy, better income prospect, better living conditions, better research and study facilities and so on in the foreign countries. The basic causes of brain drain are income inequality, different stages of growth and differences in opportunities and real earning as between DCs and LDCs.

Brain drain involves loss of strategic manpower from key positions. An outflow of such manpower creates many dislocations. It seriously affects skill formation and involves the loss of money invested in education and training. The loss of strategic manpower affects education, research and training, in infrastructure-building, creative talent, present and future technology, and the entire intellectual climate of a country and

creates a growth-retarding backwash effect. There are lots of direct and indirect costs of brain drain. The leadership, creative contributions to science, technology and development, which the emigrating people would have made, are lost in brain drain. The external diseconomies involved in brain drain are indeed very large. The loss of critical manpower which can formulate and influence policies is a serious loss for a developing country. Brain drain may involve a zero-sum game and the results may be constrained by patents. It also involves the loss of physical and working capital accompanying the emigrants. Brain drain reduces welfare and lowers domestic production.

Policies should be directed to restrict the emigration of high quality manpower which is strategic to the development of the domestic economy.

Brain Overflow

Brain overflow is the spilling over of surplus brain power which cannot be productively absorbed in the domestic economy where such brains are economically unemployed. The outflow of this type of manpower does not constitute any loss, at least in the short period; it is rather an outlet for the absorption of high quality manpower in the world economy. Brain overflow may ease domestic tension, unemployment and frustration among educated people.

Low cost of education coupled with limited productive openings has tended to produce an educational inflation in LDCs. Brain overflow is mainly caused by domestic unemployment and lack of alternative openings. Brain overflow has a soothing effect on the domestic economy. It does not affect the prevailing level of education and research. It does not also involve capital or output loss. It can also be a means to earn foreign exchange. It does not hamper the growth process; rather it helps the growth process in the short run. The effect of brain overflow is, in general, that of increasing welfare of the domestic country.

Brain Export

This refers to the export of high quality manpower generally by a labour surplus country. This is often a source of valuable

foreign exchange. For instance, a large proportion of Pakistan's foreign exchange earnings comes from brain export. Brain export constitutes the export of surplus brain power on a regular basis in order to earn foreign exchange. Many less-developed countries today are resorting to brain export.

Brain Exchange

Brain exchange is the exchange of high quality manpower between two countries. The main aim of brain exchange is to develop the country economically, socially, culturally and educationally. The process is beneficial for both the participating countries for no party incurs loss and every party receives some advantage in the form of expertise, knowhow, advice and ideas. Brain exchange may take place between two developed countries, or two less-developed countries, or between a developed and a less-developed country.

Extent of Brain Migration

Brain migration to the USA from developing countries went up to 1,03,000 in 1967. Asian brain migration to America between 1962 and 63 went up by 182 per cent. Every year, a large amount of HQM emigrates from LDCs to DCs and the outflow is mainly directed to the USA. 2,50,000 skilled Indian professionals are at present residing in the USA and this amounts to a loss of 50 billion dollars. India lost 5.5 million dollars in 1967 due to drain of HQM; and between 1962 and 1967, the extent of this loss was dollars 612,40,000 for India. The developing countries of Asia, Latin America and Africa lost 400-500 million dollars during the same period as a result of brain drain to USA alone. The influx of skilled personnel from LDCs to USA is estimated to be roughly 20,000 people per year over the immediate period ahead. During 1962-67, nearly 60,000 people emigrated to the USA. The emigration of scientists, engineers and medical practitioners to the US amounted to 16,492 in 1970 alone. During the same period (1962-67) 19,366 people emigrated to Canada. Brain migration from LDCs to DCs is continuously increasing. India lost nearly Rs 41 crores on account of brain drain during 1958-66. This estimate is a conservative one, for it does not take into

account the various social, psychological and cultural duplications created by brain drain. According to a study made by UNCTAD in 1970, brain migration from LDCs to the USA amounted to a loss of 3.7 billion dollars. On the other hand, the aid from the US was only 3.1 billion dollars. Hence, the US stands to gain from the reverse flow of HQM. This means the *reverse transfer of technology* from LDCs to DCs. From all this it appears that brain drain is a loss-generating process for LDCs, although brain overflow is an outlet for surplus manpower. Thus, the policy of LDCs should be to convert the brain overflow into a regular type of brain export which can earn sufficient foreign exchange. The brain-receiving capitalist countries must be pressurised to pay for the brain. A consolidated price may also be realised from the outgoing brain. A supplementary tax may be levied on the skilled migrants. The extension of the tax system may be spread over the globe by the LDCs on their emigrated brains. The brain-receiving countries should sympathetically consider the question of compensation to the brain-sending countries. The Third World countries must jointly cooperate in formulating a policy of compensation and in its implemention.
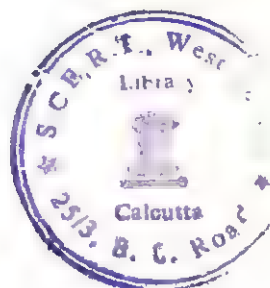
GROWTH OF POPULATION: BIRTH AND DEATH RATES

Population growth is the most fundamental demographic process with which all other demographic attributes are directly or indirectly associated. Population growth determines density, distribution pattern and composition of population. Therefore, an understanding of the process of population growth is essential for students of population geography which is related to the study of the dynamics of population as it is found on the earth's surface. In what follows, we undertake a study of the process of population growth, its determinants, components and some broad theories and ideas relating to it.

Meaning

Population growth refers to the growth of the human population in a particular area during a specific period of time. The growth may be positive or negative. Population growth may be due to natural increase. Rates of natural increase or decrease, that is, rates computed on the balance of births and deaths, give some measure of the overall gain or loss in a population through the addition of births and the subtraction of deaths. The annual rate of natural increase can be computed simply by subtracting the crude death rate from the crude birth rate. The change in the rate of growth of population can be measured either in terms of percentage or in absolute numbers. For calculating the rate of growth of population, the actual population of a given area during a particular time-period is used. Percentage rate of growth is usually calculated for a particular period. The absolute growth of population can be found out by subtracting the population of an earlier date from that of the later point in time.

Measurement of Population Growth

Geometric mean is most frequently used for measuring the rate of growth of population. For example, if a city had a population of 2,00,000 in a given year and 2,40,000 ten years later, we may find out the annual per cent of change. The increase per year per cent is 2. However, if we compute 2 per cent increase each year over the preceding year, the population figure turns out to be 2,43,800. This means that the correct figure is slightly smaller than 2 per cent because we are actually compounding. The average annual per cent increase may be computed by applying the formula:

$$P_n = P_o (1+r)^n,$$

where, P_o=The population at the beginning of the period, P_n=the population at the end of the period, r=rate of change, n=number of time-periods. This can be expressed diagrammatically in the following way:
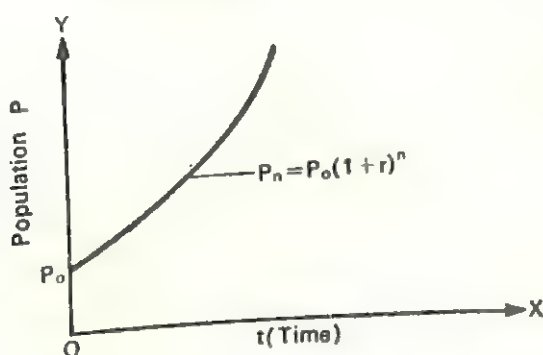
It follows from the above formula that $r = n\sqrt{\dfrac{P_n}{P_o}} - 1$

For the above data $2,40,000 = 2,00,000 (1-r)^{10}$

Taking logarithms $5.3802 = 5.301 + 10 \log (1+r)$

$\log (1+r) = 0.00792$

$(1+r) = \text{Antilog } 0.00792$

$1+r = 1.0184$

$r = 0.0184 = 1.84$ per cent.

The annual linear change in the population can be calculated by dividing the total amount of change during a given period by the number of years:

$$P_a = \frac{P_n - P_o}{n}$$

where, P_a = annual amount of change, P_o = population at the beginning of the period, P_n = population at the end of the period, and n = number of years.

It is sometimes assumed that the rate of growth of population is linear. That is, there is a linear progression at a constant amount of change per unit of time. The linear change is expressed through an upward rising straight line. This is the simplest type of assumption made for analysing the rate of growth of population over time.

Against the *geometric rate of change* (compound rate of change), there is the *arithmetic rate of change* of population growth. This is calculated by dividing the annual amount of change by half the sum of population at two points in time and multiplying it with 100. When the compounding takes place continuously and is done at every infinitesimal duration of time, it is called an *exponential change*.

In order to map the spatial pattern of population growth, population geographers follow a method of calculation where the natural rate of growth and the actual rate of growth are analysed spatially. The actual rate of growth of population is calculated by dividing the difference between the populations of the two dates by the population at the earlier date, and multiplying it by 100. Thus,

$$A_r = \frac{P_n - P_o}{P_o} \times 100$$

where A_r is the actual rate of growth of population.

It is quite clear that the natural rate of growth of population is obtained by finding out the difference between births and deaths, dividing it by the population at the beginning of the period and multiplying it by 100. Thus,

$$N_r = \frac{T_b - T_d}{P_o} \times 100.$$

The natural rate of growth of population does not take into account migration of population, but the actual rate of growth of population does consider it.

Population Trend

The trend of population growth can be known from a set of observed data on population. The trend is calculated by fitting a particular type of curve to the set of observations. The simplest type of trend is described by a straight line. The equation for this linear trend which assumes a constant amount of change per unit of time is: $Y = a + bx$. However, the straight line trend of population growth does not appear to be logically very sound, for it does not take into account the fact of compounding. While finding out a trend, it is essential to empirically examine the data by plotting them correctly. Once a trend line or curve is fitted to the population data, it can be useful both for finding out the missing intermediate values (interpolation) or for finding out the unknown values in future (extrapolation). It is in this way that through the trend we can make a projection regarding population. The population trend can be described by various types of curves:

(i) The straight line trend or polynomial trend of first degree is expressed by the straight line equation where

$$Y = a + bx.$$

(ii) The most commonly used type of trend of population growth is expressed by a *quadratic or second degree parabola*. It is used to describe a series in which the amount of change per period itself changes by a constant amount per period. There are various types of parabolic trend. The quadratic or second degree parabolic trend is defined by the equation:

$$Y_p = a + bx + cx^2$$

where Y_p is the trend value of the variable (population), x = time variable, and a, b and c are constants.

The *exponential trend* refers to the tendency of the data to grow or decline by a constant percentage per annum. Such a trend is given by the equation:

$$Y_p = ab^x$$

The exponential is also called a semi-logarithmic trend when converted into logarithmic form. The most common type of growth curve used in demography is the Logistic curve or Pearl-Reed curve. If both the earlier and latest stages of growth of population are to be represented by a trend pattern, the modified exponential curve usually is not appropriate. In such cases, a further variation is necessary, and in most cases either the *Pearl-Reed growth curve* or a simple form of a *Gompertz trend* can be useful. Both of these curves are rather complex, however their general nature can be considered here. The Pearl-Reed curve may be defined as:

$$Y_p = \frac{1}{a + bc^x}$$

Both the Pearl-Reed and Gompertz growth curves appear as an elongated S. In terms of absolute growth, these curves are useful to depict the pattern of population growth. Such a population growth curve shows a slow rate of growth of population at the initial stage, then a higher rate of growth and, at the end, a declining rate of growth.
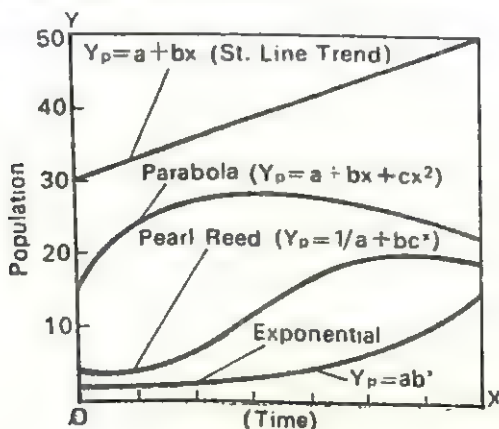
As seen earlier, the population trend may be both a straight line trend and also a non-linear trend. The various types of trends discussed above may be represented in the form of a composite diagram as shown on the opposite page.

Components of Population Growth

Mainly, there are three components of population growth: (i) Fertility, (ii) Mortality, and (iii) Mobility or migration.

Fertility

Fertility indicates the actual reproductive performance of a woman or a group of women. A woman is considered fertile if she has ever borne a child. Fecundity, on the other hand, denotes the ability to bear a child, and has no reference to whether or not a woman actually has borne a child. A common measure of fertility, especially where adequate vital statistics and other types of direct information are lacking is the ratio of children under 5 years of age to women in the child-bearing ages as computed from census data on the total population. Thus, fertility rate is determined by the number of children born every year to 1000 women of child-bearing ages (15-45).

The crude birth rate of population in any area is obtained by dividing the number of births recorded in that area during a year by its total population (preferably the mid-year population). If we multiply this by 1000, we get the birth rate per 1000 of population. All births are not generally recorded. Therefore, the crude birth rate underestimates the rate of growth of population. The corrected birth rate takes into account both the recorded birth and the possible unrecorded birth. In other words,

$$\text{Corrected birth rate} = \frac{\text{Birth in a year recorded} + \text{possible birth}}{\text{Mid-year population}} \times 1000$$

General fertility rate is calculated by dividing the number of children born by the number of mothers in the reproductive age-group (15-45), and the sum is multiplied by 1000. In order

to calculate the *completed fertility rate*, we divided the total num-
ber of children born by the total number of mothers in all the
age-groups, and the sum multiplied by 1000. Here, we take
into account the children of any mother (unmarried, widow,
married, etc.) of any age-group. The birth rate can also be
made age-specific. *Age specific* birth rates of an area are
obtained by dividing the number of births to mothers of each
age by the number of women of this age, and then multiplying
by 1000; sometimes we are interested in knowing the *total fertility
rate*. In order to measure correctly the population growth, we
calculate the number of children born per thousand females
in the child-bearing age divided into different age-groups. This
leads to the *total fertility rate* which is calucated by adding up
the specific fertility rates belonging to different age-groups.
The *total fertility rate* is the mean number of children which a
female aged 15 can except to bear if she lives until at least the
age of 50, provided she is subject to the given fertility condi-
tions over the whole of her child-bearing period. The *total
fertility rate* for a particular area during a given period is a
summary measure of fertility conditions operating in that area
during that period. It is an estimate of the number of children
a cohort of 1000 women would bear if they all went through
their reproductive years exposed to the age-specific fertility
rates in effect at a particular time. This methₒₒ is better
than some other methods because it concerns itself only with
the women who are in the fertility age-group; and it is not in-
fluenced by the general age groups.

In order to make comparison, standardised birth rate may
be calculated. *Standardised birth rate* shows what the birth rate
for a group of women would be if these women had the same age
distribution as those in some standard population. It is computed
by taking age specific birth rate for women and multiplying each
of these rates by the number of women in the standard population
in the corresponding age category of each one million persons
in the standard population. The sum of these products divided
by one million persons is the standard population. The sum of
these products divided by one million and multiplie by 1000
is the standard birth rate.

Another index of fertility is the *reproduction* or *replacement*

rate. In order to calculate the *gross reproduction rate*, we do not take into account the number of males, and the women having no reproductive power and also the male children born. We take into account only the number of mothers who have produced children, and the female children born. The female children are the future mothers. The *gross reproduction rate* (G.R.R.) is calculated in the following way:

$$\text{G.R.R.} = \frac{\text{Number of female children born of mothers of an age-group}}{\text{Total number of mothers of that age-group}} \times 1000$$

What is of course more meaningful is not the *gross reproduction rate* but the *net reproduction rate* (N.R.R.). *Net reproduction rate* indicates the average number of future mothers born to a mother of today. It is an index of self-replacement potentiality of population with given age-specific rate of fertility and mortality. The N.R.R. makes allowance for the fact that there would be deaths in any group of females between the time they are born and the time at which they complete their reproductive life. The N.R.R. is computed by applying the age-specific birth rates to the number of years lived in each group by the survivors of the original cohort after mortality has operated, summing the products, and then applying the ratio between the females born and total births, and dividing the result by 1000. The net reproduction rate was first found out by Kuczynsky.

$$\text{N.R.R.} = \frac{\Sigma(\text{Number of female births} \times \text{survival rate})}{1000}$$

If the N.R.R. is 1, the population is stationary i.e., the new mothers are just replacing the old mothers. If N.R.R. is greater than 1, population is increasing; and if it is less than 1, population is decreasing.

Mortality

Increase in population depends both on birth rate and death rate. Therefore, in demography, the measurement of

death rate is as important as the measurement of birth rate. While the birth rate increases population, the death rate decreases it. The basic index of mortality is the *crude death rate*. *Crude death rate* measures the number of deaths per 1000 of the population. In order to measure the *crude death rate*, we require the total number of deaths and the total number of the population. It is calculated by dividing the total number of deaths by the total number of population, and then multiplying by 1000. However, the crude death rate is inadequate for many purposes as a measure of mortality differences between different groups in different regions. Variations in groups occur due to variation in age and sex. Some populations change considerably in age and sex from time to time. Therefore, change in the crude death rate is of little use as an index of basic changes in mortality.

The death rate can be made age-specific. *Age-specific death rate* means the number of deaths of persons of a given age per thousand population of that age, generally by sex. This can be calculated precisely if we know the size of different age groups by sex, and if deaths for the same group are correctly known. This rate is the basis of refinement in mortality rates which are used today. This rate gives an accurate picture of mortality for both males and females of each group. For calculating the age-specific death rate, we should divide the population into different age-groups, e.g., 0-5, 5-10, 10-15, 15-20 and so on. Then, we should calculate the number of deaths occurring in each group. It is necessary to know the age of the people who have died.

$$\text{A.S.D.R.} = \frac{\text{Death occurring in a particular group}}{\text{Total population of that group}} \times 1000$$

However, we require a single figure which takes into account age and sex differences, if we are to compare the mortality rates of two populations. Such a rate is commonly called *Standardised or adjusted death rate*.

Another index of mortality used by population geographers and demographers is *infant mortality*. *The infant mortality* rate shows the number of deaths of children, generally under one

year of age per thousand live births occurring in the same year. *Infant mortality* rates serve as one of the best indices to the general "healthiness" of a society and the level of living of any population. The lower the *infant mortality* rate, the better is the level of living. The *infant mortality* rate can also be age-specific. For calculating *infant mortality*, we take into account babies in the age-group 0-9. The *infant mortality rate* (I.M.R.) is calculated thus:

$$\text{I.M.R.} = \frac{\text{Number of children who died}}{\text{Total number of children in that age group}} \times 1000$$

To be meaningful, vital rates should be standardised. *Standardised death rate* is based on age-specific death rate. Generally, the death rate is standardised for age and sex only. When the death rates of two or more populations are standardised on the same population base, their rates can be compared and, in such a case, the differences found will not be merely due to their age and sex differences. However, death rates can also be standardised for other differences in composition, e.g., education, marital composition, and the like.

In calculating the standardised death rate of standard populations, we require the number of standard population in every age-group and the death rate per 1000 in every age group. Then the death rate per 1000 is multiplied by the amount of population in each age-group and the sum is divided by the total amount of standard population.

The risk of dying from causes associated with child-birth is measured by the *maternal mortality rate*. For this purpose, the deaths used in the numerator are those arising from puerperal causes i.e , deliveries and complications of pregnancy, child-birth and puerperium.

The numbers exposed to the risk of dying from puerperal causes are women who have been pregnant during the period. Their number being unknown, the number of live births is used as the conventional base for computing comparable *maternal mortality rates*. The formula is:

$$\text{Annual Maternal Mortality Rate} = \frac{\begin{array}{l}\text{Number of deaths from puerperal}\\\text{causes which have occurred among}\\\text{the female population of a given}\\\text{geograghic area during a given year}\end{array}}{\begin{array}{l}\text{Number of live births which}\\\text{occurred among the population of}\\\text{a given geographic area during the}\\\text{same year.}\end{array}} \times 1000$$

The classification and coding of deaths as puerperal deaths vary from one country to another or even within the same country, and hence we must be cautious in comparing maternal mortality rates for different places.

The probability of survival at a particular age is calculated by means of *Survival rate*. It is calculated with respect to a particular cohort. On the other hand, the measure of mortality at a particular age is given by the *annual quotient of mortality*. The calculation of the probability of death is sometimes essential for population studies. This is done by constructing a *life table*. A life table is a purposely constructed demographic table to show the probable period of survival and the probable age of death of persons in a specified population. The *life table* shows the average expectation of life of a man and is a convenient method for summarizing the mortality experience of any population group, that is, it provides concise measures of the longevity of that population. The life table only shows the probability of death at the particular calculated age of death. For explaining the life table, let us consider the number of births as 10,000. Our interest is to know how many survive to ages 10, 20, 30 and so on. Other useful parameters such as the average length of life (expectation of life) may also be derived from the *life table*. We give on p. 69 a hypothetical abridged life table.

In the table, L_x denotes the number of people surviving to exact age x and D_x is the number of people dying between exact age x and the next exact age $(x+1)$ as shown in column (3). $D_x = L_1 - L_2$. With the help of the *life table*, the mortality risk between various consecutive ages can be calculated with the following formula:

Abridged Life Table

Age	Survivors to age L_x	Deaths between (x) and $(x+1)$ D_x	Probability of Mortality between ages x and $(x+1)$ per thousand Q_x
(1)	(2)	(3)	(4)
0	10,000	1,500	$\dfrac{1500 \times 1000}{10,000} = 150$
1	8500	1020	$\dfrac{1020 \times 1000}{8500} = 120$
2	7480	935	$\dfrac{935 \times 1000}{7480} = 125$
3	6545	1301	$\dfrac{1301 \times 1000}{6545} = 200$
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
99	1000	50	$\dfrac{50 \times 1000}{1000} = 50$
100	950	—	—

$$Q_x \text{ (probability of mortality)} = \frac{D_x}{L_x} \times 1000.$$

The rate shows the mortality probability per thousand of population (column 4). In the table, x denotes exact age in years, D_x denotes number of deaths between exact age x and $(x+1)$, L_x denotes total number of survivors to exact age x, and Q_x denotes annual mortality probability at age x.

Mobility (Migration)

The third basic component of population growth is the mobility of population. This is also called the migration of population. As we know (see Chapter III), there may be either out-migration or in-migration. Whereas out-migration decreases population stock, in-migration increases it. There

may be simultaneous out-migration and in-migration. Therefore, it is necessary to take into account both these processes of mobility. Thus, the relevant concept for population growth of a particular place is the *net migration* which may be defined as the difference between immigration and emigration. If the difference is positive, the population stock will increase. If the difference is negative the population stock will decrease. If the difference is zero, the population will remain constant. Therefore, it is clear that the population growth of a place can be regarded as the difference between the birth rate and death rate plus the difference between immigration and emigration. Or, $P_G = (B-D)+(I-E)$, where B=Births, D=Deaths, I= Immigration and E=Emigration, and P_G=Additional population stock (regarding the details about *Migration*, see Chapter III).

Determinants of Fertility

Fertility is influenced by many factors. But the more important factors are: per capita income (Y_p), percentage of population in the reproductive age group (R_p), percentage of rural population (V_p) and percentage of literacy (L_p). Thus, fertility can be expressed as a function:

$$B_r = f(Y_p, R_p, V_p, L_p)$$

where, B_r=Birth rate.

An empirical study made by the author on the determinants of birth rate in Punjab (India) revealed some interesting facts. Firstly, it pinpoints that per capita income is a weak and insignificant determinant of birth rate. The variance in birth rate can be more satisfactorily explained by the variables of percentage of literacy and of rural population. When the per capita income variable is eliminated, the regression gives a better fit and yields more significant results. Another important determinant of birth rate in Punjab is the ratio of reproductive age group to total population. But, by far the most decisive determinant of birth rate is the percentage of literacy. This implies that education in a developing economy can be an important instrument of socio-economic change.

We can now summarise the important factors influencing fertility:

(1) Fertility is very much affected by changes in age at marriage, in the proportions of women married at a given time and in the spacing of births. Marriage at late age leads to lower fertility, whereas marriage at early age leads to higher fertility. The changes in the marital conditions and in the spacing of births in married life are closely related to social, economic and cultural conditions. During the Great Depression of the 1930s, the marriage rate declined considerably in western countries and the birth rate was reduced as a consequence.

(2) Economic status of the people influences fertility. Poverty with its associated factors such as illiteracy, ill-health, poor diet, etc., keeps the birth rate high. When the proportion of protein is lower in the diet, the liver becomes weak and as a result the oestrongents of the wives cannot be neutralised by the husbands (when the husbands have weak livers). This leads to higher reproductive power among the women. Poverty limits the alternative arrangement for recreation and enjoyment. The death rate is high among the poor people. Therefore, to ensure that some children do survive, poor people tend to have a larger number of children. Better economic status generally reduces the fertility rate. Prof. De Castro, in his book, *Geography of Hunger*, has pointed out that there is a close relationship between poverty and high fertility. Wealth is associated with lower fertility.

(3) Religious and social attitudes are important factors determining the fertility rate. In traditional societies, there is a preference for large families. Marriage in such societies is a religious duty. The *Rig Veda* says that a married woman should have at least 10 children. The use of contraception and abortion do not have religious approval. Children are very often regarded as a gift of God. A large family is not only permitted,

but is regarded as a sign of prosperity, power and prestige. In a society where religious dogmas do not prevail, the birth rate is generally lower. Where people are tradition-oriented and fatalistic, the birth rate is generally high.

(4) Illiteracy and ignorance are responsible for the high rate of fertility. Ignorant and illiterate people do not know or realise the need for birth control, and do not also have the knowledge of the biology of reproduction. Education is a favourable factor for reducing fertility. It raises the age of marriage, broadens the outlook, and provides additional facilities for recreation and enjoyment. Thus, educated people have lower fertility in general.

(5) Climate is an important factor affecting fertility. Countries having hot climate have higher fertility. In hot climates, menstruation starts between the ages of 12 and 15; girls attain puberty at a much earlier age and are able to bear children. This lengthens the period of reproduction, as a consequence of which the fertility rate is increased. The opposite happens in cold climates where the rate of fertility becomes lower.

(6) The death rate indirectly affects fertility. Where the death rate is high, the birth rate has to be high in order to continue the race. On the other hand, where the death rate is low, the birth rate may possibly be low.

(7) The standard of living influences fertility to a great extent. The desire for a higher standard of living will reduce the birth rate because the maintenance and education of children will mean extra cost. The benefits from the children are realised at a much later age. A higher standard of living makes people less dependent on children and more free economically. Therefore, less premium is put on children. A higher standard of living leads to lower fertility, and a lower standard of living leads to higher fertility. For people having lower standard of living, children are the important sources of income and economic security.

Therefore, the people will put more premium on children. As a result, the fertility rate is increased.

(8) Attitudes towards family planning and birth control are equally important factors affecting fertility. The use of contraceptive devices and birth control measures reduces the birth rate. But if these devices are not used, the birth rate generally becomes higher.

(9) Family organisation affects the fertility rate. The joint-family system assures joint responsibility for maintaining the children. Therefore, fertility is not restricted. But, in an individual family system, the parents are to bear the brunt of the larger number of children. Therefore, they become more careful in determining the size of the family. Thus, the fertility rate is minimised.

(10) Social customs and traditions influence fertility to a great extent, e.g., in a society where widow remarriage system is prevalent, the rate of fertility would be higher than that in a society where it is not prevalent.

(11) Different fertility rates are found in urban areas and in rural areas. People in the rural areas practise early marriage and have many superstitions against birth control and abortion. As a result, people in the rural areas have higher fertility. But people in the urban areas are more free and do not face obstacles in the way of practising birth control measures and abortions. They also marry at a late age. Thus, fertility in the case of urban people is lower.

(12) Sterility in women or in men is responsible for lower fertility. The lower the proportion of sterility, the higher is the rate of fertility. Fertility also depends on the physiological capacity to reproduce. The physiological capacity would be higher in the case of people of better health and vigour, and lower in the case of diseased people and people of ill-heath.

(13) According to some authors, occupations have an important bearing on fertility. The Bureau of the Census of America showed that coal miners' wives had borne the largest number of children (8 0); then came

farmers' wives (7.1). Wives of bankers, brokers, lawyers, judges, physicians and book-keepers had borne the fewest children (3.4 to 3.7).

(14) Prof F.W. Notestein had found an inverse relationship between the value of the home and the number of children. The lower the value of the home, the larger the number of children, and the higher the value of the home, the smaller the number of children.

However, the '*differential fertility*' rate depends to a great extent on the different economic and social classes of the population. Only one or two factors are not sufficient in explaining higher or lower fertility of a population. Most of the factors should be considered in explaining higher or lower fertility rates.

Different countries have different fertility rates depending on social, cultural, economic and other factors. The under-developed and the developing countries have a comparatively high fertility rate, whereas the advanced countries have a low fertility rate. The crude birth rates are given below for the following countries in 1950-55/1970:

Crude Birth Rate

(1950-55)			1950-53/1970
Philippines	48.5	Australia (1970)	20.5
Pakistan (51-56)	47.1	Japan (1970)	18.8
Thailand	47.1	U.K. (1970)	16.2
Burma	44·5	Sweden (1970)	13.6
Indonesia	43.8	West Germany (1970)	13.3
Malaya	43.6	India (1970)	35.5
India (1951)	43.2	Egypt (1950)	44.4
Vietnam (1955-60)	43.1	Puerto Rico (1953)	35.1
Ceylon	41.8	Mexico (1952)	43.9
Canada (41-51)	28.7	Brazil (1953)	42.0
New Zealand		Switzerland (41-51)	17.0
(41-51)	25.8	France (41-51)	18.8
USA. (41-51)	24.9	Italy (41-51)	17.9

Source: Demographic Year Book.

Determinants of Mortality

Mortality, like fertility, is influenced by a variety of factors. These factors, apart from famines, wars and epidemics, are socio-economic in nature. They can be summed up as follows:

(1) *Rural and Urban Living.* Rural communities have generally lower death rates than urban communities. However, according to Prof. Thompson, during the last twenty years, in many urban communities, death rates have been found to be lower than those of the rural communities, particularly in certain areas. According to a study made by Dorn, the lowest crude death rate for native white males was found in the large cities and highest in the rural communities and small cities. The crude death rates for females were also highest in the rural areas and the smaller cities, and lowest in the larger cities. But when the rates were standardised for age, the above generalisations were reversed. In the USA in 1940, the crude and standardised death rates for white population of both the sexes were the lowest in the rural communities, and the highest in urban communities. The infant death rate in the largest cities was falling faster than that in the rural areas in the USA.

In Sweden, before 1910, the crude death rates in the rural areas were lower than in the cities. But after 1940, the crude death rates became lower in the cities. The urban rates were generally lower for the people under 35 than the rural rates; but, for the people of older ages, the death rates in the urban areas were higher.

Deaths at young age are mainly due to contagious and infectious diseases. Cities are now in a better position to control death from these diseases. However, in rural areas, there are certain natural advantages due to which the chronic and organic diseases can be prevented. Therefore, rural areas have smaller death rate for the aged people. Fresh air, more space, carefree life, fresh food, slower speed of life and the like are available in the rural areas, and not in the city areas. Better health services of larger cities have not yet been able to reduce their death rates to the level of those in the rural areas.

(2) *Marital Status.* Married persons generally have lower death rates than unmarried persons of the same age. Marriage leads to more discipline in the way of life. It leads to regular

and timely diet, better care for health, and the maintenance of regularity. Regarding physical vigour and social adaptability, marriage is selective. Diseased people generally avoid marriage. A significant proportion of 9 to 11 per cent of males and females who do not marry have health risk and disease, and hence, they have higher death rates. But the selective process involved in marriage varies considerably from one population to another. According to Newsholme, comparative freedom in married life from the terrible risk of syphilis must be taken into consideration. Marriage represents a better adaptation to life, physically and mentally than does celibacy.

Widowed and divorced persons have relatively high death rates. The health of the widow might have been affected by the bad health of the partner and by the hardship and worries of widowhood. Divorced people have been unable to make adjustments in married life. The instability and maladjustments both act as cause and effect of constitutional weaknesses.

(3) *Occupations.* Occupation is an important factor in determining the mortality rate. The type of work may be detrimental to health, e.g., working in mines, and certain types of works in steel mills are risky. Occupations in which one breathes a lot of dust may be bad for health. Occupation determines income and the physical surroundings of the workers. Lower death rates can be noticed at ages of 25 and over in those occupations where the work is lighter and the salary is better. However, there are exceptions, e.g., physicians and surgeons of 45 and above have death rates above the average death rate. In spite of handsome incomes, there may be occupational hazards.

Some types of workers may be already in poor health, e.g., tailors, guards, watchmen, etc. They are in the age group which would normally have higher death rates. Some types of workers are irregularly employed at heavy work and, are also poorly paid. Therefore, both their living conditions and the general physical condition are affected. Agricultural workers have relatively low death rates. Lucien March has shown death rates per 1000 males in the age group 35-44 with respect to occupation in France and England during the period 1886-1891. This is shown in the following table·

Mortality and Occupations (1886-1891)

Occupation	Per 1000 males	
	England	France
All males	11	11
Teaching	6	6
Rural labourers	6	8
Clerks	10	13
Industrial labourers	28	20
Printers	11	18

In most of the occupations, the death rates of the workers were higher than the death rates of the employers. The death rate of the most favoured class was 90 per cent of the average, whilst that of the unskilled labourers was 112 per cent of the average.

The figures for death rates in England and Wales in 1930-32 show that agricultural work was one of the healthy occupations, and factory work was unhealthy. Grinders in cutlery, cotton blow-room operatives and stevedores had a death rate more than twice as high as average. The living conditions enforced by poorly paid work are important causes for high death rates in many occupations. Prof. Thompson points out that in a city where the textile industry exists the death rate would be higher than in a city where there is no textile industry.

Occupation determines the special hazards such as those found in metal grinding, mining, stevedoring, working with poisonous materials, exposure to temperature change and so on. Occupation also determines income which, in turn, determines the standard of living of the workers. In recent years, the gap between the death rates of those in the poorly paid jobs and those in handsomely paid jobs is being bridged by the public health services.

(4) *Race Factor.* The race factor is also closely associated with differences in death rates. The climate is also responsible for the relatively high death rate among the people of tropical countries. The effect of racial differences on the death rate is

due to differences in living conditions and not to climatic or biological differences. This view is correct when we consider the fact that Japan has been able to reduce its death rates very rapidly since 1945. In general, non-whites had higher death rates than whites. But recently the crude death rates of non-whites have been falling rapidly. The mortality differences arise from differences in living conditions, medical facilities, housing, nutrition and the like. For example the Negroes are more susceptible to certain diseases than the Whites. (For determinants of migration, see Chapter III.)

Theories of Population Growth*

There are various theories of population growth such as pre-Malthusian ideas, Malthusian Theory, Optimum Theory (see Chapter IX), Natural or Biological Theories, Socio-Cultural Theories and Economic Theories. The modern theory of population growth goes by the name of the theory of Demographic Transition.

The natural theories try to find out the natural tendency which will explain the actual growth of population. These theories are optimistic regarding the influence of population growth on the welfare of mankind. They put faith in human progress as an inevitable accompaniment of social development. The natural or biological theories of population include the theories which take into account the natural qualities in human beings. These theories point out that the births and deaths of human beings are just the same as the births and deaths of animals and plants. The Malthusian theory of population is also a natural theory of population. Sadler's Density and Fecundity Theory points out that the fecundity of human beings is in the inverse ratio of the condensation of their numbers. The variation in fecundity is affected not by wretchedness and misery but by the happiness and prosperity of mankind. He believed that population cannot grow at a geometric rate because, when population is growing, the density will

*See B.N. Ghosh, *Population Theories and Demographic Analysis*, Meenakshi Prakashan, Meerut, 1977.

increase, which will lead to a decline in fecundity. The growth of population stops at a certain point where maximum happiness is attained.

According to Doubleday, "Increase in population is inversely related to food supply. The greater the supply of food, the slower would be the rate of growth of population." According to him, this natural law is applicable to animal and vegetable worlds. Fat animals or birds have lesser number of children than the thin animals or birds. The people having sufficient food articles are less fertile; and people having insufficient food articles are more fertile.

Herbert Spencer's Biological Theory points out that as the complexity of life increases, a reduction in fecundity takes place. This is the reason why fertility is lower in an industrial society as compared to a rural society.

Gini explains population growth as a cyclical process. At first, the rate of growth of population is very rapid, then it is slower and ultimately the numbers decline and the quality of civilisation deteriorates. De Castro has explained population growth in terms of protein consumption. The higher the protein consumption, the greater the fatness. Fatness leads to lower fertility. Pearl has given a logistic curve theory of population growth which increases slowly at the beginning, then increases rapidly and at last the population declines.

According to the socio-cultural theories, changes in the birth rate depend on the mental propensity and attitudes of human beings. Karl Marx gave a surplus theory of population. Dumont explained population growth in terms of social capillarity. When civilisation progressed, population declined and the first condition to achieve social capillarity is to reduce the birth rate. Brento pointed out that the birth rate is related to the availability of means of enjoyment. When such means are not available, population increases. According to Hadley, there is a correlation between a happy life and a low birth rate.

Leibenstein has given an economic theory of population growth. He observes that when the per capita income is low, population growth increases because the parents want to supplement their meagre income. But when the income of the parents

increases to a great extent, population growth automatically declines.

Population growth is mainly explained by economic factors. This is particularly relevant in LDCs. A micro economic theory of fertility can be presented in the form of the followig function:

$$C_D = f (Y, P_C, P_x, T_x) \qquad\qquad x = 1, \ldots\ldots\ldots n$$

where, C_D = demand for surviving children, Y = given level of household income, P_C = net price of children (benefit minus cost), P_x = prices of all other goods, and T_x = Tastes for goods relative to children.

In the above analysis, children are considered as a special kind of consumption good so that fertility becomes a rational economic response to the consumer's demand for children relative to other goods. Other things remaining constant, the desired number of children can be expected to vary directly with household income and inversely with prices (cost) of children, and the strength of tastes for goods relative to children. However, for LDCs, the desire for children is inversely associated with income. The number of children (population growth) depends on benefit and cost of children (cost-benefit approach). The cost-benefit approach to population growth is discussed in the following diagram.
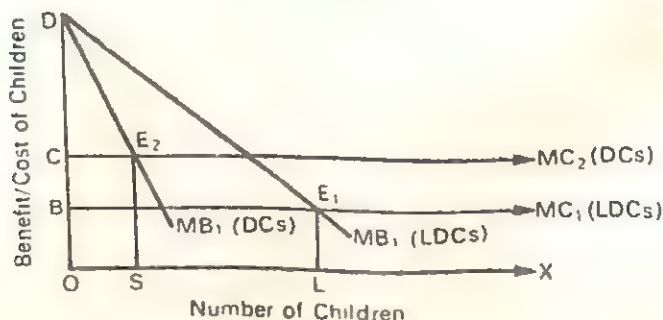
As the diagram shows, OB is the cost of a child in LDCs, and OC is the cost of a child in DCs OD is the benefit from the

first child for DCs and LDCs. But marginal benefit for an additional child drops at a slow rate for parents in LDCs and at a faster rate for the parents in DCs. For the sake of simplicity, the costs have been assumed as constants. The equilibrium for an LDC family is at E_1, and for a family in DCs is at E_2. This shows that LDCs will have a higher rate of growth of population (OL) than that of DCs (OS).

The process of population growth is also regarded as a process of transition. This is formally explained by the theory of demographic transition.

Theory of Demographic Transition (Modern Theory of Population)

The term 'Demographic Transition' was coined by Frank W. Notestein. Population condition is a function of birth rate and death rate. Birth rate and death rate work in such a way that population growth is either stationary or high, or low. Population growth experiences a transition from one stage to another stage. This transition is called demographic transition. The theory of demographic transition is the modern theory of population growth.

The theory of demographic transition says that a country has to pass through three different stages of population growth:

(i) A period of stable population growth (low population growth); (ii) a period of rapid population growth; and (iii) a period of stationary or slowly growing population.

In the first stage, the birth rate and the death rate are high, and the growth rate of population is low. In the second stage, the birth rate remains more or less stable (or may even decrease a little at a later part of the period), but the death rate falls rapidly. As a result, the growth rate of population increases very rapidly. In the last stage, the birth rate starts falling and the death rate remains almost constant. Therefore, the rate of growth of population becomes very slow or stationary.

This generalisation is based on the experience of the advanced countries which have passed through the first two stages and are now in the final phase of incipient decline in the rate of growth of population. The underdeveloped countries are now passing through the second stage. The three stages of population
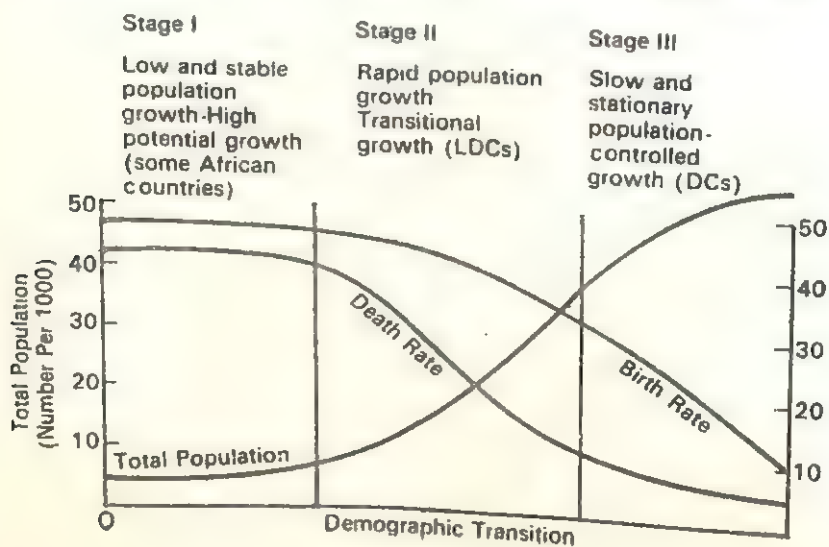
growth can now be explained in detail (see also the diagram below).

First Stage

A pre-industrial society which is in the first stage is characterised by high birth rate matched by a high death rate. Death rate is high because of poor diet, inadequate medical facilities, poor sanitation, etc. The death rate becomes high also because of famine, crop failures, flood and other uncontrollable natural calamities.

In the primitive societies, the birth rate is high because the death rate is high. A tribe with a high death rate cannot perpetuate itself unless the birth rate is correspondingly high. In tribal warfare, the weight of numbers is very decisive. In such societies, paternity is glorified, and the cultural factor is fertility-oriented. A woman with many children is held in high esteem, and lack of {fertility is regarded as a matter of great shame.

The people are poor, having very low income. Therefore, a large family is regarded as a necessity to increase the family income. Children are an asset to the society and parents. More

Stage I — Low and stable population growth-High potential growth (some African countries)

Stage II — Rapid population growth Transitional growth (LDCs)

Stage III — Slow and stationary population-controlled growth (DCs)

Total Population (Number Per 1000)

Death Rate

Birth Rate

Total Population

Demographic Transition

children are also regarded as an insurance against old age by parents. People being illiterate, superstitious and fatalists, are averse to any methods of birth control. The children become earning members at an early age, and they do not require much expenditure for their upbringing and education. They provide, at the same time, economic and non-economic securities to the parents. Therefore, no restraint is put on birth rate. But, since both birth rate and death rate are very high, the economy experiences a stable rate of population growth. Britain passed through this stage prior to the Industrial Revolution. Countries of Central, Western and Eastern Africa and South-East Asia are included in this stage where the increase in population is conditioned by the frequent occurrences of famines, pestilence, floods and droughts.

Second Stage

The second phase begins with economic development. In this phase, a fall in the death rate is not immediately accompanied by a decline in the birth rate. Therefore the population grows at an accelerated rate.

The reduction in the death rate occurs as a result of certain direct and indirect economic changes, the most important of which is the availability of improved medical facilities, better quality food products, balanced diet, health facilities and so on. Improvement in transport helps to reduce the incidence of famines, and thereby helps to reduce the death rate. Another factor that helps to reduce the death rate is the regularity of food supply in sufficient quantities. But this factor also helps to increase the birth rate. The industrial revolution is preceded by the agricultural revolution. Improvement in agriculture means improved food supply, to make possible a better standard of living, which reduces the death rate but at the same time acts as an encouragement to increase the birth rate. Public opinion however acts in favour of reduction in the death rate.

But the birth rate does not correspondingly decrease; on the other hand, it may increase. Reduction in the birth rate requires a more long-term fundamental change which does not happen in the early stage of industrialisation. Leibenstein maintains that

if income increase is below the level of the required critical minimum, population growth is accelerated. People do not have any inclination to reduce the birth rate because, with economic growth, employment opportunities increase and children are able to add more to the family income. With the improvement in the standard of living and the dietary habits of the people, life expectation also increases. Increase in the birth rate is also followed by the entrance of a large number of women in the reproductive age group. The birth rate is more difficult to reduce as compared to the death rate because the forces that can reduce the birth rate often face social disapproval. Social and religious customs are also moulded in favour of a high birth rate. For instance, the Catholic religion is opposed to the use of contraceptives. People do not make any efforts to control the size of the family because of the presence of religious dogmas and social taboos towards family planning. It is difficult to break with the past social institutions, customs and beliefs.

Thus, with the decline in the death rate, and almost no change in the birth rate, the rate of growth of population becomes very rapid. The population explosion keeps the per capita income at a lower level and stands in the way of improvement in the standard of living. Most of the developing countries are passing through this stage of population growth.

Third Stage

In the third stage of demographic transition, the birth rate declines and tends to equal the death rate so that the rate of growth of population declines. Children as resources involve both utility and cost. With the increase in the size of the family, the cost of rearing the children also increases, which cannot be met with a given increase in income. The operation of the law of diminishing marginal utility from each additional child would impose restriction to further increase in family size. In an industrial society, as compared to an agricultural society, the cost of education and maintenance of children, and the working age, are higher. The average age of marriage in the industrial sector is higher. In such a sector, the effective reproductive period is much shorter than the biological reproductive

period. Thus, the relative rate of growth of population in an industrial sector is smaller than that in an agricultural sector. This phase is characterised by a very high rate of growth of industrialisation which is noticed in the industrially advanced countries.

Increasing mobility of female labour in the advanced stage of industrialisation necessitates smaller families. Prof. Duesenberry observed that the demonstration effect has a catch. Once a particular standard of living is achieved, it is very difficult to lower the standard. A higher standard of living may increase the appetite for a still higher standard. At this stage, the couples are often confronted with a problem : either a baby or a car? Many will choose a car rather than a baby. In an industrialised society, the traditional customs and beliefs which favour a high birth rate are broken along with other changes in the society. Increased income of the parents helps to reduce their dependence on children. Education creates self-discipline and the power to think rationally. It broadens the mind and becomes an instrument of change. The people readily adopt family planning methods.

In the advanced stage of industrialisation, population growth may slowly decline because there is a shift of population from agriculture to industry. The industrial sector has a comparatively low birth rate and a low death rate. The decline in the rate of growth of population continues only up to the point where the whole of the surplus agricultural population is transferred to the industrial sector. Thereafter, the population grows at a constant rate. Thus, the birth rate is reduced and tends to equal the death rate, which is already low. The advanced countries are passing through this stage, where the population is increasing at a slow rate. Europe, USSR, Japan and Anglo-America have reached this stage and have completed the demographic transition.

It has been pointed out that once completed, the demographic cycle may start again and complete its course. The rejuvenation of the demographic cycle was experienced by North America after the Second World War when the birth rate went up considerably, and continued for a long period of time

Spatial and Temporal Dimensions of the Transition

The duration of the cycle has been different in different countries. It has acted in different fashions in western and non-western Europe, and the Third World. The First World countries (countries of north-western Europe excluding Ireland, North America, Australia, New Zealand, south-eastern South America, France, Switzerland) completed the transition during the late 19th or early 20th century. The Second World (non-Western Europe) started the transition cycle during the early part of the 20th century. Excepting Austria and Czechoslovakia, most of the countries of the southern and south-eastern Europe remained in the first stage. During the thirties of this century, countries like Finland, Austria, Argentina, Switzerland and Ireland passed on to the third stage, and some Second World countries were experiencing moderate increase in population (second stage). However, in the forties of this century most of the Second World countries entered the third stage (including Japan and USSR). The Second World completed the transition much more rapidly than the First World.

The Third World countries have been experiencing explosive population growth in the second stage of the transition. Countries like India and China entered the second stage in the fifties of this century. In the sixties, some countries entered the second stage. It is very difficult to say how long the Third World countries will have to stay in the second stage. However, the Third World should take advantage of the experiences of the First and the Second Worlds regarding control of population growth. Thus, it can be expected that the Third World will be able to control population growth at a much faster rate than what would otherwise have been the case.

Effects of Demographic Transition

Demographic transition has produced the following effects in different countries:

(1) It has modified rather favourably the population-resources balance.

(2) It has qualitatively changed the demographic structure, such as change in literacy, standard of living, health and so on.

(3) It has changed the age structure of population by producing a larger proportion of young population in the whole population endowment.

(4) It has also changed the share of urban population in the total population. The ratio of urban to rural population has increased as a result of transition.

Population Projection*

Population projection has an important place in population geography. On the basis of certain assumptions, population projection seeks to estimate the future growth pattern of population, its size, migration, birth rate and death rate, etc. Projection is simply a rational presumption. It is not necessary that whatever is projected, would be true. Projection is neither mere foretelling nor mere supposition. Projection is really a reasonable combination of all these three. Projection is based on past and present trends and facts. It is based on trends and extrapolation method. But it is not sure that whatever has happened in the past or is happening at present, will also happen in the future. Projection is mixed with probability; and projections are less precise than scientific quantities.

*For details, see, B.N. Ghosh, *Population Theories and Demographic Analysis*, Meenakshi Prakashan, Meerut, 1977, pp. 330 ff.

PATTERNS OF POPULATION COMPOSITION

The composition or characteristics of population can be represented in many ways. There are many types of population composition. Population composition may be broadly divided into three types: biological composition, cultural composition and economic composition. Under biological composition, we discuss race and ethnicity, colour, fertility, mortality, sex ratio, age structure and so on. Cultural composition involves education, literacy, marital status, religion, language and so on. Economic composition consists of working and non-working population, unemployed, underemployed, surplus labour, economically active and inactive populations and the like. Since we have already discussed some aspects of the biological composition of population, we will restrict our discussion to a few aspects only. Economic composition will be taken up separately in Chapter VI. In what follows, we will discuss the main biological and cultural characteristics of population.

A: Biological Characteristics of Population

The biological characteristics of population will include here racial and ethnic composition of population, age composition (determinants of age, age pyramids, age groups, age indices, and world patterns of age structure), sex composition of population (definition, importance, determinants, sex ratio at birth, sex ratio at death, sex selectivity among migrants, reasons for sex disparity, and world patterns of sex ratio).

Racial and Ethnic Composition of Population

The population of a country may consist of different races and communities. There may not exist any genetic differences

among human races. The notion of pure races is unrealistic for the earth's population is essentially one of mixtures, or mongrels. There is no hard and fast rule for distinguishing races. However, anthropologists consider only three primary races—Caucasoids, Negroids, and Mongoloids. The white or the Caucasoid group is the most numerous and widespread over the earth, amounting to nearly half the human population. This race consists of Europeans, Indo-Iranians and Semites and Hamites. The Indo-Iranian branch (350-400 million) is concentrated in the northern and eastern parts of South-west Asia, and the northern and central parts of India. Semites and Hamites are found in northern and north-eastern Africa (80 million) and the western and south-western parts of Asia Minor (20 million). Negroid peoples are found mostly in Africa, and Asiatic blacks are found in southern India and parts of Southeast Asia and Oceania. The Mongoloid peoples (one billion) are yellow and brown in colour. They are found in East and Central Asia, Malaya and Indonesia. The blending of American Indian, White, and Negro strains has produced in Latin America a population mixed in character. In Asia, we find Eurasians who are mixtures of Whites and Mongoloid. The exact numbers of these races are not known.

At present, there is no conclusive classification of the world population on the basis of races and communities. The physical features that differentiate various races and ethnic groups are not very important for judging the culture of people. The qualities of different races are not functional in nature. Similarly, the division of the earth into two parts consisting of DCs and LDCs, does not seem to be a very happy division. The people in the LDCs mostly have pigmented skins (black, brown and yellow), but they are not inferior in quality. The division mainly speaks of only economic conditions; it does not imply cultural retardation of any group.

In the USA, the percentages of White and Negro population were 88.1 and 11.9 respectively in 1955. In the same year there were only 1.9 crore Negroes in America. In 1900, 90 per cent of the Negro population lived in the south, and that is why the south was called the 'Black Belt'. In the twentieth century, a large number of Negroes migrated to the north. Now, America

is a cosmopolitan country. In Russia, 76 per cent of the population is Slav. Now there are more than 100 different races, such as Uzbeki, Kazak, Jew, Armenian, etc. China has been described as the land of many small races and tribes. The main race is the Hans (94 per cent). In Japan Malayan Mongolian constitutes 60 per cent, Chinese Mongolian 30 per cent and Inu Pelecosictic 10 per cent of the population. Northern Sri Lanka is inhabited by Tamilians (12 per cent of total population). There are 5 lakh Moors, 16 lakh Hindus, 5 lakh Muslims, 7 lakh Christians and 52 lakh Buddhists.

Age Composition of Population

The population of an area includes persons of various ages. The age composition is important for understanding the natality and mortality of a community. Age differences may create social and economic differences. The importance of age composition is discussed in the next section.

Importance of Age Composition

The age composition of a population (sometimes called age structure or age distribution) is one of the most basic characteristics of a population. One cannot proceed very far in the study of population growth or migration without an examination of age composition. All aspects of an individual's or community's life—social attitudes, economic activities, political propensities and so on, are affected by age. Age influences the needs, thinking, attitude and behaviour of people. The age structure very much influences the socio-economic life of a nation. Age data are functional to those responsible for planning different types of activities. The LIC depends very much on the age data. Age data are also required for employment, marriage, retirement and a number of other social and economic activities of life. The age structure enables us to determine the proportion of the labour force in the total population. It is helpful in finding out the dependency load. It indicates the approximate number of people who are attaining working age and retirement. Thus, an estimate may be made of the net addition to the woking force for which new jobs are to be created. The relative proportion of producers and consumers will

determine the capacity of a community to save and invest. Consumption and production also depends to a significant extent on the age structure. When the dependency load is very high, there is a severe pressure on the working population. This requires heavy demographic investment which is mainly unproductive in nature.

For understanding the future growth of population, it is necessary to know the age structure because it affects the marriage rate and reproductive performance of the population. Thus, on the basis of age structure, it is possible to know whether a country has a progressive or regressive type of population. The study of age structure also helps us in knowing the number of old persons for whom old-age pensions may have to be provided by the state.

However, age data in a country are most likely to be inaccurate. Apart from ignorance and carelessness, there are many reasons to hide the actual age of persons. The parents of unmarried girls who have reached marriageable age will understate the age of the girls. Similarly, widowers and bachelors (who are becoming old), will give lower ages, particularly if they are eager to marry. Another reason for giving a wrong age is the superstitious belief that it is unwise to state one's age correctly as it is liable to reduce one's span of life.

For the population geographers it is very difficult to map the age statistics. Secondly, not all countries conduct censuses to collect regularly the data for age. In LDCs, people are also ignorant about their exact dates of birth. Mostly, in the case of females instances of understatement regarding age seem to be very high. The population geographers, while making use of age composition data, do take the help of different devices like age grouping, age pyramids and age indices. These techniques can help to minimise the incidence of errors in age statistics.

Determinants of Age Structure

The age structure of a population is determined basically by three factors—fertility, mortality and migration. Fertility determines the population proportion in different age categories. The countries which have high fertility rates have a large proportion of their population in the young age group (0-15).

The life expectancy in these countries being low, there is a small proportion of population in the old age group (60 and above). Thus, in these countries, the population is heavily weighted in favour of the young age group. These countries are typically less-developed. However, the countries which have low fertility and high life expectancy are characterised by small proportion of people in the young age group and relatively large proportion of people in the old age group. Most of the DCs fall in this category.

If mortality is low among the young and old it results in high and increasing proportion of persons in the higher age groups. On the other hand, declining mortality in LDCs increases the proportion of people in the young age group.

Migration is very often age- and sex-selective. Generally, the people in the working age group (15-45) are found to be extremely mobile as compared to the old and very young people. Thus, the place wherefrom migration takes place has a smaller proportion of people in the working age group, but the place of in-migration witnesses a larger proportion of such people. In this way, the age structure of a country undergoes changes over time. The age structure is also influenced by natural calamities like war, famine, pestilence, and the like.

Age data are conveniently analysed with reference to devices like age pyramids, age groups and age indices. These devices are discussed in the following sections.

Age Pyramids

The age pyramid is constructive for analysing the age composition of a population. The usual procedure for graphically representing the age structure of a population is by constructing 'age pyramids'. The vertical axis is graduated in groups of years, usually 5, beginning with 0 at the base and up to 80 or 90 at the top; and the horizontal axis shows either the numbers or the percentage of males and females within these groups. Under normal conditions, the number of people at each year age will be fewer than in the preceding year. It is for this reason that the age structure of population graphically represented tends to take the shape of a pyramid.

Normally, the males are kept to the left and females to the

right side of the vertical axis. The shape of the pyramid will differ according to the relative proportion of the different age-groups in the total population. Certain basic types of pyramids may be distinguished. First, if a population has unchanging fertility and mortality it is a stationary population and each step in the pyramid differs from the one below only by the number of deaths in that age group. Death, emigration and reduced fertility will affect the shape of the pyramid in those groups which are involved. If, however, the number of births increases from year to year, the population type will become progressive and the pyramid will widen at the base; decline in the number of births causes a regressive population with a pyramid which is narrow at the base and has the shape of a bell. A high rate of growth of fertility (baby boom) will enlarge the base of the pyramid. But low fertility and death will reduce the base of the pyramid. The LDCs have broad-based pyramids, whereas the DCs have narrow-based pyramids.

The representative LDCs have a broad base but a narrow tip. This reflects a situation in which there is a large percentage of children and a small percentage of elders in the population. In the industrialised countries, however, the pyramid has a narrow base and tapers off much more gradually. The United Kingdom is a typical example, although in the United States of America the recent rise in fertility has caused the base to widen. In the case of India, the age pyramid has a very wide base because of the large child population; but it tapers towards a point more sharply than in the case of any other country, indicating the low longevity of the Indian population. There are relatively very few people in India who live beyond the age of 50.

However, the age pyramids do not permit cartographic representation. Thus, they are not helpful for making regional comparison of age structure. (For the shapes of age pyramids, see Chapter X.)

Age Groups

Regional comparison of population can be made possible by dividing the population into various age groups. The age groups are devised quinquennially, decennially or into just three groups

(young, adult and aged) for which data may be presented as absolute numbers or as percentage of the total population. Age grouping makes possible the spatial comparison of population by means of chorpleth maps. The three-fold classsification is not completely standardised, but it is widely used in practice.

Young Group (Juvenile)

This group includes young people of 0-9 or 0-14 years of age. This group is already non-reproductive and increasingly non-productive. It is an expensive segment, for it must be fed, clothed, housed and educated. Besides, an abundance of young lives also assures a suffocatingly high birth rate in the near future. The youthful group is proportionately large in economically less-advanced countries of the world where the birth rate is high. The proportion of children, sometimes called "juvenility", is below one-quarter in parts of Western Europe due to low fertility and thus contrasts greatly with some countries of Africa, Latin America and South East Asia, where over half of the population may be under 15.

(b) *The Aged Group* (60 and over, or 65 and over)

In this group there is usually a strong majority of females and widows who are mostly non-productive. The aged group is proportionally larger in the economically more advanced countries where the young group shrinks.

(c) *The Adult Group* (15-59, 15-64, 19-59, or 19-64 years)

This group is economically most productive, biologically most reproductive and supports the bulk of the other two groups. This is also the most mobile age-group. The proportion of the aged to the total population tends to increase as the population evolves. The porportion of a population grouped as adult varies from one country to another but generally the proportions are highest in the advanced countries and lowest in the underdeveloped ones.

In short, high fertility usually leads to a population structure heavily weighted in the young dependent group with relatively fewer elders. Low fertility, by contrast, produces a structure in which the proportion of elders is relatively high and the youthful relatively low. Europe typifies the latter condition and Asia, Africa and Latin America the former.

Age Indices

Another method of studying age composition is the calculation of age indices. A clearer picture of the relationships of the three age groups may sometimes be gained by calculating and mapping age indices. Age indices can be represented cartographically on a map. This can help the population geographers to make regional comparison of age structure. Various ratios involving the three main age groups form several significant age indices. The calculation of such ratios is significant from the point of view of manpower planning and analysis of growth, migration and so on. The following are the important age indices of population:

(i) $\dfrac{\text{Young}}{\text{Adults}}$

(ii) $\dfrac{\text{Young}}{\text{Aged}}$

(iii) $\dfrac{\text{Young}}{\text{Adults}-\text{Aged}}$

(iv) $\dfrac{\text{Aged}}{\text{Young}+\text{Adults}}$

(v) $\dfrac{\text{Aged}}{\text{Adults}}$

(vi) $\dfrac{\text{Aged}}{\text{Young}}$

(vii) $\dfrac{\text{Young}+\text{Aged}}{\text{Adults}}$

The last ratio (vii) in the above pattern, is one of the most important ratios. It is known as the dependency ratio. It

Dependency Ratio

Country	1970	2000
Europe	1.28	1.30
Russia	0.97	1.02
N. America	1.54	1.36
Japan	0.98	1.08
Australia & Newzealand	1.47	1.30
South Asia	1.63	1.66
East Asia	1.20	1.15
Africa	1.60	1.95
Lat. America	2.28	2.42
Oceanea	1.25	1.45
World	1.42	1.52

compares the proportion of a population which is in the relatively non-productive ages, under 20 (or 15) and over 60, with those of the working age 20 to 59. It reflects the percentage of the population which is unproductive and, therefore, is a drain on the country's manpower resources. The dependency ratio is a burden on the resources of the country. This ratio is very high particularly in LDCs. The young and old people involve expenditure for their maintenance. The dependency ratios for a few countries are shown in the following table. The table shows that for relatively developed countries, the dependency ratio is smaller than that of the less-developed countries.

World Patterns of Age Structure

In LDCs, there are higher percentages of people over 40 years of age. In most of the western, central and Mediterranean countries of Europe, the percentage of children in the total population is small. The same is also the case with Japan, Australia and Argetina. The United States, USSR, Canada and New Zealand occupy an intermediate position in which children form 30 to 39 per cent of the population. A small proportion of old people is generally found in LDCs. In western and central Europe, the percentage of old people is more than 10. The percentage of old people is between 5 and 9 in countries like Anglo-America, USSR, New Zealand, Japan, Argentina, Australia and Mediterranean Europe.

The world population is very youthful today. Children under the age of 15 constitute almost half the total population of the Third World countries while they make up only a quarter of the population of developed nations. For example, 45 and 48 per cent of the population of Nigeria and Kenya respectively were below 15 years in 1972. For Brazil, the comparable figure was 42 per cent and for Indonesia, India and the Philippines it was 45, 42 and 43 per cent respectively. In countries with such an age structure, the youth dependency ratio, that is, the proportion of youth (below 15 years) to economically active adults (ages 15-64) is very high. Thus, the working force in developing countries must support almost twice as many children as they do in the wealthier countries.

For example, in Sweden and the Soviet Union, the working force age group (15-64) amounts to almost 65 per cent of the total population. This work force has to support only 21 and 27 per cent respectively of the population who are its youthful dependents. By contrast, in countries like Egypt and Ghana, the economically active work forces and the child dependents together approach 50 per cent of the total population. In general, the more rapid the population growth rate, the greater will be the proportion of dependent children in the total population and the more difficult it becomes for those who are working to support those who are not.

Sex Composition of Population

Communities differ in sex composition, i.e., composition of male and female. Sex composition is a subject of great interest to the population geographer. Sex ratio is an index of the socio-economic conditions of an area. It is an impor-tant tool for regional analysis. It has a profound effect on the demographic structure of a region. It is an important feature of any landscape. It is a function of three basic factors: sex ratio at birth, sex ratio at death and sex-selectivity among migrants.

Definition of Sex Ratio

Sex ratio signifies the number of females per thousand males. An inverse enunciation of the ratio (i.e., the number of males per 1000 females) is also given sometimes. Sex ratio may vary among different regions. In the USA, the sex ratio is high (males are larger in number). *Primary sex ratio* is the sex ratio at the time of conception, *secondary sex ratio* is the ratio at the time of birth, and *tertiary sex ratio* is the ratio found at the time of enumeration.

Importance of Sex Ratio

Sex ratio generally influences the form and tempo of life in any country. The balance between the sexes is an important aspect of population structure. It is important for the following reasons:

(1) It affects the labour supply through marriage and fecundity. If the proportion of males is higher than that of females, more workers will be available.

(2) The excess of males tends to lower the age of marriage for females. Early marriages lead to considerable disparity in age between husbands and wives. This difference in age tends to increase widowhood.

(3) Early marriage of females may also lead to increased fertility and population growth.

(4) Sex ratio which is affected by fertility, mortality and migration plays an important part in determining birth and death rates in a community.

(5) It is found that a population which has a higher proportion of females also has a relatively lower death rate as compared with a population where males preponderate.

(6) An adverse sex ratio (i.e., when the proportion of females is small) leads to the emergence of many social and moral evils like prostitution and S.T.D., impairing the morale of the workers.

(7) Sex ratio is an important factor for determining the death rate of any population. Women generally have lower death rates than men at most ages in most countries. If females constitute more than half of the population, the total death rate is considerably affected. The scarcity of either women or men of adult age will reduce the marriage rate; and this will affect the crude birth rate.

(8) Sex ratios of a population are related to the extent of employment of women outside home, status of women, and so on.

Determinants of Sex Ratio

Sex ratio is influenced by birth, death and migration. Apart from these factors, natural calamities like war, famine, earthquake and so on will have their effects on sex ratio. It also depends on the status of women, nature of enumeration of sexes in a particular population of an area and the like. Sex ratio can be understood with reference to (i) *sex ratio at birth,*

(ii) *sex ratio at death*, and (iii) *sex selectivity among migrations*.

Female sex is biologically stronger than male sex. Consequently, the females tend to outlive the men. In almost all countries the male mortality rate is higher than female mortality rate at all ages. As the male infants have higher mortality rates, the sex ratio becomes balanced at about 4 years of age. After this age, the imbalance begins to grow, so that at the age of 95 or so, there may be two thousand females per 1,000 males. In LDCs, female mortality is higher than that of males. The following may be the reasons for higher female mortality and lower sex ratio in LDCs.

Reasons for Lower Sex Ratio (Less females per 1,000 males)

(i) Girls in LDCs are not as carefully looked after as boys. As a result, infant mortality among girls is very high.

(ii) Early marriage, absence of birth control, children at early age, and frequency of birth, lead to the death of many women in the reproductive ages. At the time of census, women are not counted properly because of their illiteracy and social customs which keep them behind curtains, resulting in under-reporting of female population.

(iii) Migration from LDCs has largely been male-dominated.

(iv) The proportion of female births is lower in LDCs than in the DCs.

(v) In the past, female infanticide was very common.

(vi) Early marriage leads to diseases of the uterus and vagina. Early intercourse is injurious to health. Thousands of child wives march from the nuptial bed to the funeral pyre every year.

It is a biological fact that more males are born than females. Both primary and secondary sex ratios are in favour of males (more males and less females). This does not mean that all countries in the world have similar natural sex ratio. In countries where pre-natal losses are low, the sex ratio at birth is also low, and those countries where the pre-natal losses are

high, the ratio is also high. The Muslim countries exhibit a higher level of births of males. It is to be noted that in these countries, the status of women is relatively low. Different socio-economic conditions reveal different natural sex ratios. For example, in India, Muslims, Hindus and Christians have different sex ratios. Sex ratio is not only a function of socio-economic conditions but also many other factors such as the status of women, race, ethnicity, standard of living, diet, social system, religion and so on.

Migration is sex selective in nature. Long distance migration from a place mainly involves males, whereas short distance migration is characterised by female migrants. Marriage involves changes in the sex ratio in the sense that after marriage, the wives have to go to the houses of their husbands. In many big commercial and industrial centres of the world the males outnumber the females. In the agricultural sector on the other hand, females outnumber the males. When the migrants visit a distant place for better employment, they do not take along with them their female members. This fact also goes to change the sex ratios of the two concerned places.

Apart from the above three factors, the sex ratio may also be influenced by many other conditions and situations. These include war, famine and other natural conditions. War is mainly fought by males. It is observed that the countries which were involved in the first and second world wars had, as a consequence, more female members than males. Many men died in the world wars. The wars not only caused high mortality among men but also reduced birth rate. This ultimately reduced the birth of male children. Epidemics like plague, influenza and malaria considerably changed the sex ratio in India in the early part of the persent century.

Like internal sex ratio, international sex ratio is also influenced by a host of factors, one of which is the international migration among different countries. The migration from LDCs to DCs is primarily male-dominated. Likewise, sex ratio is found to be different in urban and rural areas. In western countries, the males outnumber the females in rural areas and the females outnumber the males in the urban areas. The opposite is the case in LDCs, particularly in India. In DCs,

women migrate from rural areas to urban areas in search of employment opportunities, leaving the males to look after the farms. In the urban areas of LDCs, females have to face prejudice against employment, mobility and freedom. The jobs suitable for females are also not available in sufficient numbers. All this will discourage the migration of women from rural to urban areas of LDCs.

World Patterns of Sex Ratios

World patterns of sex ratio are incomplete in the absence of adequate amount of data. The important differences between DCs and LDCs do not exist. However, it is evident that in LDCs, particularly in Asia (with some exceptions) there is widespread male predominance. Asia has a deficiency of females. The most likely explanation is that in Asia, females have a higher mortality rate than males. This may be the result of the harder lot of women caused by the culture of that area. The same is also true for Arab states and South West Asia. Male predominance is also found in Malaya, Sri Lanka and Hawaii. In Europe, USSR, Germany and other DCs, there is female predominance. The countries which were affected by war showed less of males as compared to females. In Western Europe, the prevalence of low birth and death rates points to an aging population in which males are a minority. Sex ratios of some selected countries are given in the following table:

Sex Ratios of Selected Countries

(Females per 1,000 males)

Country	Year	Sex Ratios
Congo	1955-57	1,060
Nigeria	1953	1,046
South Africa	1960	1,005
UAR	1960	986
Canada	1961	978
Mexico	1960	1,005

Country	Year	Sex Ratios
USA	1960	1,030
Argentina	1961	972
Columbia	1951	1,011
Peru	1961	1,009
China	1953	930
India	1981	935
Indonesia	1961	1,028
Iran	1956	965
Japan	1960	1,037
Korea	1960	1,038
Pakistan	1961	901
Vietnam	1960	1,070
France	1961	1,056
Italy	1960	1,041
UK	1961	1,061
USSR	1961	1,209
Australia	1960	978

Source: Desai, P.B. *Size and Sex Composition of Population in India, 1901-1961.* p. 5.

From the table it becomes clear that sex ratio varies from country to country. The patterns are different in DCs and LDCs, but a definite type of difference does not exist uniformly between these two types of countries.

B: Cultural Characteristics of Population

Population composition is also based on culture like literacy, religion, language, marital status and so on. Some of these cultural components may be discussed below:

Religious Composition

Religion is an important feature of a population. History furnishes many instances of the religion of a population functioning as a motivating force. There were many religious wars fought in the past in Europe, Israel and other places. The

religious force was much stronger earlier than it is now. But it is still a significant force. The partition of the subcontinent of India into the two states of Pakistan and India following World War II had as its basis the rivalries between Hindus and Muslims.

Religion is concerned mainly with the well-being of mankind on earth. But actually, in many places, religions have departed from their humanitarian goals and striven instead for wealth and temporal power. Religions have engaged themselves in ruinous factional fights and political intrigues. All religions have left an imprint on the customs, art, literature, architecture, food habits, politics, and cultures of mankind. The imprint is particularly strong where the religion was combined with state power, as in Spain and France.

Religion has been a divisive as well as a unifying force. The Nazis destroyed six million Jews. The hatred between Arabs and Jews in the eastern Mediterranean lands remained at the boiling point for a long time. Ireland is seriously split between the Catholic south and the Protestant north. Religion also plays an important role in food habits, birth control and so on. But, for the population geographers, religion is difficult to map and its world pattern is very difficult to analyse. The data on religion are indeed inadequate. Christianity, Buddhism, Hinduism and Islam are very widespread religions in the world. Christianity prevails in the western Hemisphere and in Europe, Buddhism is concentrated in East Asia, Hinduism in South Asia, and Islam in southwestern Asia, North Africa, and parts of southern and southeastern Asia. There are approximately 780,000,000 Christians, 660,000,000 Buddhists, 380,000,000 Hindus, and 320,000,000 Muslims in the world.

Linguistic Composition

Language is a meaningful population characteristic for the purpose of mapping. It is closely related to nationality. It is a part of ethnicity. There are at present several thousand different languages in the world. Many of these languages may be subdivided into numerous dialects. However, there is no definite information available on this issue. A common language within a country fosters cohesion and unity. It strengthens

nationalism and patriotism. There can be no doubt that language differences foster separatism in some countries. This is particularly true of Canada, Belgium, India, and Sri Lanka. India is subdivided into a number of linguistic states. However, in spite of the existence of four languages, national development and cohesion did not suffer in Switzerland. The DCs have mostly internal linguistic homogeneity. It has been found that the language of a strong and powerful nation with a large colonial empire and tráde links tends to become inter-nationalized. In this way, English and French became international languages.

In LDCs, linguistic diversity is especially found in Negro Africa and some parts of Asia. This may be partly responsible for the slow tempo of economic development in these countries. Multiple languages are found in Asian countries, particularly in the southeast and south where lauguages have created separatist tendencies. Latin America, on the contrary, has a high degree of linguistic cohesion and homogeneity. For the unified and smooth development of a country, it is necessary to have a common language. and an international language through which international communication is possible. Too many languages may create diversity in unity which may be a bottleneck towards the development of the country.

Marital Status

Marital status refers to the proportion of a population that consists of single, married, widowed or divorced people. Marriage is the legal union of persons of opposite sex. The legality of the union may be established by civil, religious or other means as recognised by the laws of a particular country. It is the age at which marriage is or can be performed. This age varies from society to society, and from country to country. It may also be legally regularised. The marriage age in the agricultural sector is lower than that in the non-agricultural sector. The legal age for marriage in India is 18 years for girls and 21 for boys. The marriageable population consists of persons who are legally free to contract marriages. *Nuptiality* measures the rate of marriage among the population. The *Nuptiality rate* measures the frequency of marriage. Just as

the life-table is used to illustrate mortality experience, we may use a similar model to illustrate the marriage experience of a man or woman, more often the latter. Here, we follow a generation of female births through life, subjecting them to two decrements—marriage and death. In the Nuptiality table, we are interested not only in the number surviving at each age, but in the proportions of those who have remained single and those who have married.

The well-being of a society is conditioned by the proportions of its people falling within the several marital groups. It is important to determine the marital status of the population of a country with respect to the median age of the first marriage. This affects the length of the reproductive period and therefore the birth rate. In a society where early marriage is therefore the birth rate. In a society where early marriage is the custom, the birth rate is generally very high. In most of the LDCs, the marriage age, both for girls and boys, is very low as compared to the marriage age in DCs. The married state among adults is prominent among both sexes and monogamy is the most universal form of marriage. Polygamy was prevalent in the mid-seventeenth century. It was prevalent in many countries, including China. Absolute monogamy is at present legally enforced in the western countries.

The median age of marriage differs from country to country. In the USA the median age of marriage was 22.8 years for boys and 20.2 years for girls in 1961. American couples complete reproduction at an earlier age so that the women can enter into the job market to supplement the family income. It is very difficult to find a uniform pattern of marriages in the world. Data are not available on marriages for different countries. Without consideration of the age structure, a comparison of marital status is not meaningfully possible. Marriage is most universal in India, Sri Lanka, Japan and Egypt. Formal contract marriage is very rare in Latin America, although common law marriage is widespread. In Britain, marriage has always been influenced by war and economic factors. The marriage rate was high before and after the two world wars. The marriage rate was comparatively low between 1881 and 1890. During the Great Depression of the thirties, and between 1942 and 1943 the marriage rate was abnormally low. In

general, the marriage rate in Britain is between 15 and 20 per thousand of population. Ninety per cent of the population of Britain gets married before reaching 55 years of age. The marriage rate among the females declined between 1851 and 1951. A large number of young men emigrated from Britain, as a result of which, during the period, the number of young women exceeded the number of young men by 10 per cent.

In the USA, there is a smaller proportion of women among the unmarried; but the proportion of widows is larger, because women in America have higher longevity. In the USA out of every 3 persons of 14 years of age, 2 are married. The mean age of marriage has become lower in America. According to the census of 1970, the age of marriage for women was 20, and for men 23. Among the people of the age group 14-24, 33 per cent women and 20 per cent men were married. For people above 35, more than 90 per cent were either married, divorced or widowed.

Educational Composition of Population

Among the different qualities of a population, education perhaps is the most important. Education gives people a sense of independent judgement and power to distinguish between good and evil. Lack of education is an obstacle to economic development in nearly all LDCs. The future growth of a society depends on the investment in education at present. The number of years of formal schooling is a fair index of a man's educational attainment. But this type of data are not available in LDCs, although they can be found in DCs. It has been pointed out that data on years of schooling do not provide a valid measurement of comparative educational accomplishments, because the duration and standard of schooling are highly variable in different countries. By literacy, one can measure the educational status of a person. But literacy is not uniformly defined to make an international comparison possible.

After almost three decades of rapidly expanding enrolments and hundreds of billions of dollars of expenditure on education, the plight of the average citizen of LDCs seems little improved. There has been a growing awareness in many developng nations

that expansion of formal schooling is not always to be equated with the spread of learning. Too much investment in formal schooling, especially at the secondary and high school levels, can divert resources from more socially productive activities. Higher education in LDCs is a very much smaller world than that of primary and secondary levels. The proportion of enrolled students in higer education is less than 3 per cent of all students, while the proportion of teachers in higher education is less than 8 per cent of the total. Third World universities seem to be maladjusted and out of step with the real needs of development as are the educational institutions at lower levels. Most Third World universities have been modelled in structure and function on the older institutions in the industrialized societies. This does not suit the requirements of LDCs.

The educational system reflects the essential nature of the society to which it belongs. At the same time education can influence the future shape and direction of society in a number of ways. Thus, the linkage between education and development is a two-way process. Educational reform has the great potential for inducing socio-economic reform in the society as a whole. It is necessary to reform the overall educational system in LDCs by modifying both the conditions of demand for, and the supply of educational opportunities and by re-orienting curricula in accordance with the real resource needs of the countries. Such countries should modify the economic and social norms and incentives outside the educational system, and also the internal effectiveness and equity of the educational system by appropriate changes in course-content, methods of selection, promotion and so on. Education must be made productivity-oriented and need-based.

Educational budgets in LDCs should grow more slowly than in the past to permit more revenue to be used for the creation of rural and urban employment opportunities. A larger share of education budgets should be allocated to the development of primary, as opposed to secondary and higher education. Subsidies for the higher levels of education should be reduced as a means of overcoming distortions in the aggregate private demand for education. The beneficiary of education should bear a larger and rising proportion of his education costs.

Primary school curricula should be related to the needs of the society. For the poor and meritorious students, some sort of subsidies will have to be introduced for reducing socio-economic inequality. To compensate for the inequality effects of most existing formal school systems, some form of quotas may be required to ensure that the proportion of low-income students at least approximate their proportions in the overall population. All this shows that there is need for real reform in the educational systems of LDCs, if it is to contribute to economic growth and development. (See also the Chapter VII, Literacy and Quality of Population.)

ECONOMIC TRAITS OF POPULATION

The economic traits of population are crucial for understanding the levels of living, stage of growth, economic achievement and failures, quality of population, education pattern and human capital formation and so on, in a country. Economic traits are influenced by many factors. Similarly, economic traits of population will influence many aspects of population geography in a region. The economic characteristics of population will be reflected in the labour force, activity rate, dependency load, occupation structure, income structure, employment and unemployment, labour use efficiency, income distribution and so on.

Importance and Problems

There is no doubt about the importance of the economic character of a population in the analysis of the spatial aspects of population. It is economics which, in fact, directly or indirectly influences all other variables. However, while using economic data with respect to population, population geographers face a number of problems. Firstly, in many countries, adequate economic data are not available for analysing population problems. All countries do not gather statistics on vital matters pertaining to work force, occupation structure, industrial classification, unemployment, underemployment, surplus labour, female labour participation, income distribution, poverty and the like. Secondly, the concepts and definitions used for classification of economic data are not standardised. Therefore, such data cannot be used for international comparisons. Thirdly, the information and data collected by many countries are not

complete or reliable. Data on many aspects of population are indeed lacking in most of the LDCs. For example, the data on the distribution of work force into various industrial categories may not be collected by many countries. Similarly, the data on the participation rates of women and child labourers may not be available for use. The data on the economic composition of population are not really adequate for different types of analyses and studies.

Economically Active and Inactive Population

By economically active population we mean the people whose marginal productivity is positive, i.e., who are adding to output/income. These people are included in the labour force and obviously they fall in the working age group. In this connection, it is necessary to have an idea of the activity rate of population. Activity rate is the ratio of the working population to the total population, usually computed with reference to a given sex age group. The activity rate is also called the labour-force participation rate. The economically active population consists of that part of manpower which is actively engaged in the production process. The economically inactive population consists of that part of manpower which is not participating in the production process directly, but is engaged in household activities, in studies or in leading an idle life. For appreciating the participation, one can calculate the general activity rate or the age-specific activity rate, sex specific activity rate and so on. The crude activity rate is the percentage of economically active population in the total population of the country. It is also called crude labour force participation rate. The activity rate for persons of working age group (15-59) is called the general activity rate. The general activity rate can be calculated separately for different ages and also for different sexes. The rate can also be standardised if the data for age and sex are standardised in a particular geographic area.

It is also necessary to know about the dependency ratio in the total population of a country. This ratio is calculated by dividing the number of children plus the aged by the number of adults, and multiplying the result by 100. The dependency ratio shows the ratio of the inactive population (which includes

children and old people) who cannot contribute to the production process but have to be fed and clothed. This imposes a great burden on the national economy. Thus, the higher the dependency load, the greater the demographic investment required. It was estimated by Colin Clarke that for every one per cent increase in population, capital investment of 4 per cent of the national income will be necessary to maintain the additional population. This 4 per cent investment is known as demographic investment which cannot lead to any increase in productivity.

The replacement ratios for working ages are the number of expected entrants into the labour force of a particular age group. The replacement rate is the number of entrants minus the number of departures from the working force, which can be expressed in percentage for a specified working age group. Replacement ratios for working ages indicate the potential population replacement with respect to the working force. It has an important implication for the future growth of the working force. For example, if there are more entrants than those who are leaving, it indicates that the work force will grow.

Employment Status

The economically active population may be gainfully employed or underemployed. Gainfully employed people are those who are employed fully and productively either in terms of output or in terms of income. There may be various degrees of employment. The employment rate refers to the number of people employed as percentage of the economically active total population. The proportion of fully employed people is the number of employed people minus the number of unemployed and underemployed people in the total labour force.

Labour is efficiently employed if its marginal productivity is equivalent to its wage rate. The marginal productivity of labour can be calculated by fitting a Cobb-Douglas type of production function. Multiple regression analysis can give the elasticities of human labour (in man-days) wherefrom the marginal productivity of labour can be calculated. If it is found to be equal to the wage rate, we can say that the labour

is efficiently employed. On this basis, it may be found that in many LDCs, labour is not efficiently used, particularly in the agricultural sector.

A part of the labour force may remain underemployed. Underemployment is a situation where work is done at a level below full employment. The full employment norm may be fixed in terms of time of the occupation or in terms of income generation. In some studies, 280 days' work per year with 8 hours' work per man-day, has been taken as the full employment norm for agricultural occupation. The income criterion is very deceptive for many reasons. Another criterion for measuring underemployment is the capacity and willingness to undertake additional jobs over and above the present one. It is also defined as a situation where marginal productivity of labour falls far short of the market wage rate. Underemployment may be low, moderate or severe, and it is caused mainly by limited workload, and lack of alternative openings. Under-employment is a conspicuous problem in LDCs, particularly in the agricultural sector. It consists of slow or fewer motions, lower intensity of work, lower income and lower productivity. Work-sharing and work-stretching are the two important forms of underemployment in LDCs' agricultural scene. There are many symptoms of underemployment in agriculture, e.g. land fragmentation, farm size and other characteristically structural features of low-income agriculture. Underemployment may be measured both in terms of volume of work and the number of labourers, as shown in the following figure.
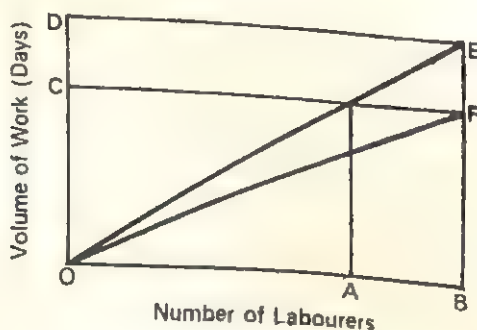
In the above figure, OE represents increasing additions to work by additional labourers when optimal employment can be created in agriculture through various reformative measures. OE represents the same in low-income agriculture where no such labour-supplementing measures are in practice. DE indicates that the primary sector is not in a position to create any more openings. As the figure shows, OB workers can perform OD work if sufficient work is available. But they actually perform OC work, which can be performed by OA labourers. Thus, underemployment in terms of workers would be AB, and in terms of work it would be CD.

Underemployment is caused by many factors such as dualism, high man-land ratio, lack of alternative openings, high rate of growth of population, fixed supply of land and so on. Under-employment is prevalent both in agriculture as well as in industry. However, it is quite low in industry as compared to agriculture. The calculation of underemployment can be done by taking into account the standard man-land ratio approach. Any increase in man-land ratio above the standard ratio can be called a situation of underemployment. When the actual man-land ratio is higher than full employment man-land ratio, there is underemployment. It can also be measured by the producti-vity or income criterion. According to this method, the actual return of income of the labourers is compared with some standard income. If the actual income is lower than the standard income, there is underemployment. Another method is the situation when the wage level is higher than the marginal productivity of labour (see figure on Disguised Unemploy-ment). Underemployment is a serious problem in a country like India. Prof. Raj Krishna has estimated underemployment in India on the basis of NSS data. The severely underemployed were defined as those who were working less than 28 hours in a week, and moderately underemployed were those who were working more than 28 but less than 42 hours in a week. The persons who were working less than 14 hours in a week were considered to be very severely underemployed, or nearly un-employed. The extent of underemployment is given below:

Underemployment in India (1971)

Hours worked in a week	Number of under-employed (Million)	Percentage of underemployed in labour force
Rural		
1-14	8.46	5.7
15-28	23.52	15.9
Urban		
1-14	1.29	4.0
15-28	3.37	10.5

Source: Report of the Committee on Unemployment

A portion of the economically active population may also remain *unemployed*. An unemployed person is regarded as one who is seeking work for wages, but is unable to find any suited to his capacity and conditions. Unemployment is a situation which exists when members of the labour force wish to work but cannot get a job. It is therefore used in the sense of 'involuntary' unemployment, rather than a voluntary unemployment decision. *Unemployment rate* is a measure of the extent of unemployment of the labour force at any particular time. There are various types of unemployment, such as open unemployment, seasonal unemployment, structural unemployment, technological unemployment, cyclical unemployment, and so on. Cyclical unemployment is caused by fluctuations in industry marked by alternate periods of boom and depression. It is due to the lack of effective demand or spending. Seasonal unemployment arises either from seasonal variations in demand or from those in production condition. Associated mainly with agriculture, it is a wide-spread phenomenon in Indian villages. Technological unemployment is due to the introduction of new technology in the production process. Adoption of new and improved technology renders many workers jobless until they are retrained and until

reformation of techniques expands income and output to a level as would permit reabsorption of the displaced persons. Unemployment may be open or may be disguised. Disguised unemployment may arise out of misallocation of resources, high man-land ratio, fixed factor proportions, lack of capital, inadequate motivation of the workers, and so on. Structural unemployment is caused by the structural causes as can be found in LDCs, such as subdivision and fragmentation of land holding, misallocation of labour, lack of capital and immobility of factors of production, and so on. Disguised unemployment is defined as a situation of too many persons on too little land. It may take the form of lower intensity of work. It is a situation which involves zero marginal productivity of labour. Disguised unemployment or surplus labour is that part of the labour force in the rural economy that can be removed without reducing the total output even with unchanged technique of production. The term is not applied to wage labour, but it denotes a condition of family employment in peasant communities. A number of people are working on family farms, contributing virtually nothing to output. Such labour is surplus in the sense that its marginal productivity is zero or negative. That is, if a portion of the labour force is taken away, output will not come down. In simple language, supposing the agricultural operation in a peasant family can be carried on by 6 persons each putting in 8 hours' work per day, the family can be said to contain disguised unemployment if its working members exceed 6. If this family farm contains 8 working members, 2 can be said to be 'disguisedly' unemployed. Disguised unemployment is shown in the following diagram where NQ amount of labour is disguisedly unemployed.

It is generally believed that disguised unemployment in underdeveloped countries varies between 20 and 30 per cent. Some of the empirical estimates are given below:

J.L. Buck's study is sometimes cited as a case which reveals considerable surplus labour in China. Cleland estimated that Egypt contained a surplus population to the extent of 50 per cent. Warriner found 2 million surplus workers in Egypt, and 25-30 per cent surplus labour in Eastern European countries. Mellor and Stevens found a substantial number of surplus
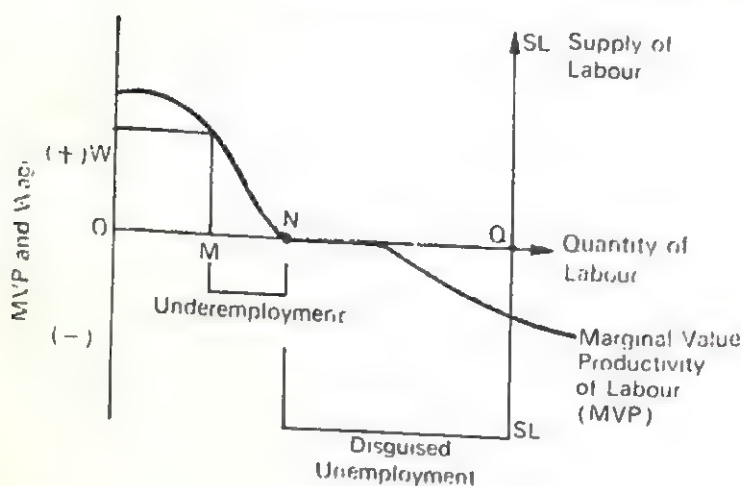
workers in Thailand. Rosenstein Rodan's study revealed 10 per cent surplus labour in southern Italy. Young Sam Choo found 11 per cent surplus labour in South Korea. Stroup and Gift's study also disclosed labour surplus in South Vietnam.

For India, Tarlok Singh estimated 26.2 per cent surplus labour and Shakuntla Mehra 17.1 per cent, N.A. Muzumder estimated that roughly 71 per cent of the farmers of Bombay, Karnataka region were affected by disguised unemployment. Ashok Mathur estimated that in West Bengal, U.P. and Punjab 33.1 per cent, 8.8 per cent and 4.5 per cent respectively of the work force were disguisedly unemployed. J.P. Bhattacherjee calculated that 17 to 19 per cent of the labour force of Bihar was surplus. S.S. Gill found that 28 per cent of the labour force in Punjab was surplus.

Current rates of open unemployment in Third World areas average from 10 to 15 per cent of the urban labour force. But this is only part of the story. Unemployment among young people aged 15 to 24, many of whom have a substantial education, is typically almost twice as high as the overall average. The following table provides some rough estimates of unemployment by age for eight selected Third World urban areas.

Urban Area	Ages 15-24	Ages 15 and above
Ghana, large towns	21.9	11.6
Bogota, Columbia	23.1	13.6
Buenos Aires, Argentina	6.3	4.2
Chile, urban areas	12.0	6.0
Caracas, Venezuela	37.7	18.8
Bangkok, Thailand	7.7	3.4
Philippines, urban areas	20.6	11.6
Singapore	15.7	9.2

Source: Edgar O. Edwards, *Employment in Developing Countries*, Ford Foundation, New York (1973).

When the underemployment is added to open unemployment, it is found that almost 30 per cent of the labour force of rural and urban areas in Third World nations is unutilized. The projection for 1990 indicates that the rate of Third World unemployment will rise steadily and that the total numbers unemployed may reach 65 million by 1980 and almost 90 million by 1990. Adding projections for the underemployed could give a figure as high as 500 million workers who are either unemployed, partly employed or whose productivity is very low. The employment position of some of the Third World countries is shown below:

Indicator	1970	1980	1990
All LDCs			
Employment (000)	617,244	773,110	991,600
Unemployment (000)	48,798	65,620	88,693
Unemployment Rate (%)	7.4	7.8	8.2
Combined unemployment and underemployment rate (%)	27		
Africa	39		
Asia	26		
Latin America	20		

Source: ILO *Internation Labour Review* 112, No 6 (1975)

Labour Absorption

It is wholly unrealistic to push the rural surplus labour out to the cities. It is better to provide productive work to these surplus labourers in the agricultural sector itself. These labourers can work for land improvements by organising cooperative farming societies in the country. Underemployed workers can be organised on their own and their neighbours' farms on reciprocal aid for capital building, and they need not be given a wage.

There are many jobs in the rural areas which require comparatively little capital, e.g., land reclamation, afforestation, soil conservation, road development, etc. Local work schemes such as supplying of drinking water, linkage road construction, village school and library building etc., which are part of the community development programme, may be encouraged. Area planning for the purpose of employment creation may be integrated with the strategy of block development.

There is also wide scope for creating common assets in the village e.g., tanks, fuel, plantation, fisheries, common pastures, etc. which can be built up through labour-intensive methods. Village and small scale industrial units have a large employment potential. They have to be encouraged by giving incentives, facilities, rewards and the like. Provision can be made for producing the basic wage goods in the rural areas through village and cottage industries. Such labour-intensive industries should be started. Self-employment opportunities need to be extended by giving credit facilities, technical help, raw materials and marketing arrangements.

The small and marginal farmers should be given labour absorbing modern inputs and suitable extra-income generating supplementary occupations. Development of infrastructure can absorb a large amount of surplus labour. The country must have a suitable employment policy. Irrigation, with all its catalytic effects on other desirable inputs like better seeds, fertiliser, multiple-cropping, etc. can absorb considerable number of labourers productively. Through irrigation alone agriculture can absorb, as Paglin has shown, two to three times more labour productively. The average labour requirement for crops grown in irrigated areas is 3.6 times the labour requirement for crops

grown in unirrigated areas. Minor irrigation has great employ-ment potential; 60 per cent of the net cultivated area in India lacks irrigation facilities. A proper system of land reform bids fair to increase employment in backward agricultural economies. A suitable plan dove-tailing the non-agricultural with agricul-tural development can be expected to give productive openings to surplus labourers in the rural enclaves of LDCs.

Work Force

A worker is one who participates in economically productive work. In India, in the 1971 census, a person engaged primarily in household duties or getting education was not considered as a worker. The working force in India is calculated as the percentage of workers to total population.

The following are the main determinants of work force in a country:

(i) The demand for workers in different professions and occupations.

(ii) The size of the work force.

(iii) The wage level in the country.

(iv) The age of entry into the work force and the age of retirement from the work force.

(v) In a country where the death rate is very high, the size of the work force becomes smaller.

(vi) A country having a high rate has more children in the total population. Therefore, the work force cannot immediately grow rapidly.

(vii) Migration generally takes place from among the work-ing population. Therefore, it reduces the size of the work force.

(viii) Work force also depends on the population-resource ratio. For example, if the supply of land is very limited, but the family is expanding, then more and more family members will have to join the work force.

(ix) The size of the work force depends also on the levels of literacy and education. The more literate the society, the greater the delay in the entry to the work force.

(x) Where the women are granted freedom and status, they can easily enter into the work force.

(xi) Marriage at an early age leads one to enter into the work force at a very early age.

(xii) Effective participation in the work force also depends upon health, climate, working conditions, and the nature of the job.

The number of people searching for work depends primarily on the size and age composition of the population. A sudden reduction in fertility will gradually reduce the labour force. Present labour force projections suggest annual increases of the order of 2.1 per cent for LDCs during the present decade, and 2.4 per cent and nearly 2.8 per cent in the 1980s and 1990s respectively. The labour force patterns of DCs and LDCs are given below:

Countries	Labour force in millions (per cent of total)		
	1970	1980	1990
Developed countries	488(32.5)	542(30.4)	593(26.6)
LDCs	1,012(67.5)	1,239(69.6)	1,547(72.4)

Source: ILO, 1974, Geneva, p. 64.

The *composition of the work force* varies from country to country. Mostly, the work force consists of male members. The percentage of females is generally much lower than that of the males. The extent of female participation depends on the status of women, their education, extent of their household duties and their mobility. Secondly in the rural areas more people participate in the work force. Agricultural occupation is such that it requires constant engagement of a large number of persons. In the industrial sector, a large percentage of people is engaged in education and training for a long period of productive life. Therefore, the participation rate is lower than that in the rural sector. However, the participation of women in the rural areas is generally larger as compared to that in the towns. The participation of children below 15 years is very low in the total

work force. In a poor society, the participation rate for the children is much higher than that of a rich society.

Occupation Structure (Distribution)

The work force is divided into various industrial categories. This is a part of the economic composition of a population. The different types of occupations can be known from the industrial classification.

Industrial Classification

The United Nations has suggested the following nine types of industrial classification:

    (i) Agriculture, forestry, hunting and fishing,
    (ii) Mining and quarrying,
    (iii) Manufacturing industries,
    (iv) Construction,
    (v) Electricity, gas, water and sanitary services,
    (vi) Commerce,
    (vii) Transport, storage, and communication,
   (viii) Services, and
    (ix) Not classifiable elsewhere.

Although the classification made by the UN seems to be very reasonable, some minor modifications have been introduced by many member-countries depending on their local conditions. Thus, India has also adopted the nine-fold classification by making some minor changes. However, the classification made by India is well comparable with the scheme of the UN. For the purpose of simplification, the nine-fold classification can be reduced to the following three-fold classification:

    (i) Primary activities (agriculture, forestry, hunting, fishing, livestock, mining, quarrying, etc.),
    (ii) Secondary activities (manufacturing, construction, power generation, etc.), and
    (iii) Tertiary activities (commerce, storage, transport, miscellaneous services, etc.).

Many people have in recent years, introduced *quarternary services* as a separate type of activity which includes research and administrative work. Hovever, the traditional three-fold classification seems to be quite reasonable and simple. On the basis of these activities, we can analyse the occupation structure of a conutry.

Occupation Structure

Occupation implies trade or profession. It reveals the nature of economic progress of a country. It is related to agriculture, industry and services. Occupations depend upon the degree of economic development and sophistication of a country. For instance, 40,000 occupations were recognised in England and Wales, but in India only one thousand occupations were recognised by the census authorities. There are many types of occupations. The UN has proposed the following occupations as constituting international standard classification:

  (i)   Professional, technical and related workers;
  (ii)   Managerial, executive and administrative workers;
  (iii) Clerical workers;
  (iv)   Sales workers;
  (v)   Farmers, fishermen, hunters, lumbermen and related workers;
  (vi)   Workers in mines, quarries and related occupations;
  (vii) Workers in transport and communication;
  (viii) Craftsmen, production process workers and labourers not classified elsewhere;
  (ix)   Service, sports and recreation workers;
  (x)   Workers not classifiable by occupation; and
  (xi)   Members of the armed forces.

On the basis of occupations, society can be divided into many categories—such as primitive, rural, traditional, western, colonial, industrial, socialist and so on, as done by Derruau. He has divided the world societies into nine categories.

In backward countries, structural rigidity is reflected in the occupational pattern. Whereas the percentage of people depending on agriculture is very low in developed countries, it

is very high in underdeveloped countries. The developed countries have a high percentage of people in the non-agricultural occupations, but the underdeveloped countries have a very low percentage of people in such occupations. The rate of economic development may be described by the rate at which the 70:30 occupation structure in underdeveloped countries is changed to 20:80 approximately. The transfer of population from the agricultural to the non-agricultural sector must be accompanied by a rise in productivity in the former sector for providing food and raw materials to the latter sector. An upward change in agricultural productivity has to be accomplished with the help of many structural changes in the economy, for instance, socio-economic institutions, production frontier, market mechanism, incentives, etc. The occupation structure of some of the countries is given below:

Occupation Structure (% of population)

Country	Year	Primary	Secondary	Tertiary
Canada	1901	43.6	27.5	28.9
Canada	1931	32.6	28.2	39.2
Canada	1946	26.0	33.9	40.1
Britain	1901	9.0	46.5	44.5
Britain	1911	7.8	46.3	45.9
Britain	1931	6.0	47.0	47.0
Britain	1946	5.3	47.9	46.8
USA	1900	38.2	19.8	42.0
USA	1920	27.6	27.2	45.2
USA	1930	21.9	25.8	52.3
USA	1940	19.3	26.6	54.1
India	1901	71.4	11.7	16.8
India	1931	74.7	10.2	15.0
India	1961	76.4	11.0	12.6
India	1971	73.2	10.1	15.1
India	1981	69.0	13.0	18.0

Source: N.A. Khan, *Problem of Growth of an Underdeveloped Economy*, p 127.

Economic progress is generally associated with certain distinct, necessary and predictable changes in occupation structure. Clark observes that a high average level of real income per capita is associated with a high proportion of labour force in the tertiary sector. Similarly, low per capita real income is associated with low proportion of labour force in the tertiary sector and high percentage of population in agriculture. High average real income per capita compels a large proportion of population to engage in the tertiary sector. Clark contends that the proportion of population engaged in commerce and finance is a precise measurement of the degree of economic development.

Clark gives two main explanations for the shift of population from the agricultural to the non-agricultural sector.

(1) With the increasing real per capita income in agriculture, less would be spent on consumption (because of low income elasticity of primary products). It follows then that the labour force engaged in agriculture must decrease.

(2) Output per worker may be increasing more rapidly in some sectors than in others. If average output per head in the primary industry is increasing faster than in other fields it will accelerate the movement of labour from agriculture. Prof. Fisher writes that 'in every progressive economy there has been a steady shift of employment and investment from the essential primary activities, without whose product life in even its most primitive forms would be impossible, to secondary activities of all kinds, and to a still greater extent into tertiary production... The shifts of employment towards secondary and tertiary production revealed by the census are the inescapable reflection of economic progress'. Clark-Fisher thesis leads to the following generalisations:

(i) Real per capita income is low in the countries where the percentage of population engaged in the primary occupation is very high.

(ii) Per capita value productivity is higher in secondary and tertiary sectors than in the primary sector.

(iii) Agricultural productivity is higher in countries with small percentage of agricultural labour force than in

countries with high percentage.

(iv) In the industrial countries, the percentage of secondary employment tends to fall whereas that of tertiary employment tends to rise.

Bauer and Yamey have criticised the Clark-Fisher thesis on a number of grounds. They are of the opinion that there is no clearcut occupational classifications in LDCs. It is also likely that the proportion of resources devoted to the tertiary sector would be high in the early stages of development. Tertiary activities are also dissimilar and they may not provide an index of economic progress. In fact, the correlation between occupational distribution and economic progress is only accidental.

The occupation pattern in a country may be optimum or non-optimum. An occupation pattern is optimum when the national output cannot be increased by transferring labour from one sector to another. A non-optimal occupation pattern means a situation where the transfer of labour will bring about an increased output in any of the sectors without a corresponding reduction in output anywhere. Occupation pattern in most LDCs is non-optimum in the sense that these countries contain a huge amount of surplus labour, the diversion of which will bring about larger output in other sectors. The desirability of change in occupation pattern will, however, depend on many factors.

It is not always true that per capita income is lowest in the primary production and highest in the tertiary production. In Australia, per capita income is higher in the primary sector than in the secondary and the tertiary sectors. The following are the differences between the tertiary occupation in DCs and in LDCs:

(i) In DCs, tertiary occupation emerges out of high level of income in other sectors. But in LDCs, this occupation emerges out of scarcity of employment in other sectors.

(ii) In LDCs, the distributive services in the tertiary occupation are low-income type and poverty-induced; but those in developed countries are high-income type and

prosperity induced. Thus, there is a basic difference between the two.
(iii)   Tertiary occupations in developed countries are highly capital-intensive whereas those in LDCs are highly labour-intensive.

The question of change in occupation structure has to consider two important facts. If the push factor in agriculture can release some surplus labour without affecting output and if the pull factor is ready to utilise that surplus labour more productively, the occupational structure can be changed. With the economic progress of an underdeveloped country, deficiency of skill and capital can be made up to some extent, and hence, a change in the occupation pattern may not be difficult. Intensive agriculture is expected to absorb some surplus labour. However, in the case where there is no surplus labour, the question of occupational change has to be based on a strict comparison of cost and benefit of labour transfer involving a number of considerations of both the sectors, particularly the capital per worker and the marginal value productivity of labour.

Income and Expenditure
In LDCs, the general level of living tends to be very low for the vast majority of people. This is true not only in relation to their counterparts in rich nations but often also in relation to small elite groups within their own societies. The low level of living is manifested quantitatively and qualitatively in the form of low income (poverty), inadequate housing, poor health, limited or no education, high infant mortality, low life and work expectancy and, in many cases, a general sense of hopelessness. The consideration of employment without income and expenditure is meaningless. Therefore, it is necessary to take into account the income and expenditure of people while considering the economic composition.
The Gross National Product (GNP) per capita is often used as a summary index of the relative economic well-being of people in different countries. In the early 1970s, the total GNP of the world was 32,00,000 million US dollars, of which more

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than 27,00,000 million originated in DCs and less than 5,00,000 million originated in LDCs. If we consider the distribution of world population we find that approximately 85 per cent of the world's income is produced in DCs by less than one-third of the world population. More than two-thirds of the world's population is therefore producing only 15 per cent of the total world output. The LDCs with 70 per cent of the world's population subsist on less than 20 per cent of the world's income. The collective per capita income of LDCs is less than 1/14th of the per capita income of rich nations. The per capita income (GNP) of some selected countries is shown below:

US dollars (1971)

Country	Per capita GNP	Country	Per capita GNP
United States	5,160	El Salvador	320
France	3,360	Paraguay	280
UK	2,430	Philippines	240
Israel	2,190	Sierra Leone	200
USSR	1,400	Kenya	160
Mexico	700	China (P.R.)	160
Costa Rica	590	Nigeria	140
Brazil	460	India	110
Columbia	370	Ethiopia	80

Source: *World Bank Atlas* 1974, Washington DC. World Bank Group, 1974.

The above table shows the per capita income gap between DCs and LDCs. The table shows that in 1971 the United States had almost 65 times the per capita income of one of the poorest countries, (Ethiopia) and almost 50 times that of one of the world's largest nations, India. Over the years the situation has not much improved relatively for these poor nations. The average rate of growth of GNP for LDCs is around 3 per cent per year, but it is nearly 5 per cent for the DCs. This means

that the income gap between rich and poor countries is widening at the rate of nearly 2 per cent per year. If we take into account the rate of growth of population in LDCs (2.5 per cent per year) and that of DCs (0.8 per cent per year) then the actual gap between per capita income in these two types of countries comes to nearly 3.8 per cent.

Obviously, the disparities between DCs and LDCs are growing. It is also interesting to note that even within a country the disparity between rich and poor people is on the increase. This is the basis of the existence of poverty. The gap between the rich and the poor is generally greater in LDCs than in DCs. For example, if we compare the share of national income which accrues to the poorest 40 per cent of a country's population with that of the richest 20 per cent as a rough measure of the degree of inequality, we find that Brazil, Columbia, Peru, Mexico, Kenya, Malaysia and so on do have substantial income inquality. Some other countries like India, Chile, France, Denmark, Tanzania and West Germany have moderate inequality. Taiwan, Israel, Canada, Japan and USA have relatively lesser inequalities in the overall income distribution. There does not seem to be any strong correlation between the levels of per capita income and the degree of income inequality.

Related to the concept of inequality is the concept of *poverty*. *Absolute poverty* implies the total number of people affected by poverty in a given population. Poverty is generally estimated by the number of people whose consumption per capita is less than what constitutes the poverty line. Poverty line is equivalent to the expenditure which is essential to give 2300 calories per person per day. A person or a country is poor either because he or it possesses little wealth, or because he or it has only a small income. At one time unemployment was the main cause of poverty, whereas today poverty is mainly to be found among the old people in rich countries and in almost all types of people of LDCs. Poverty might be defined today as insufficient income to provide what is now regarded as a minimum standard of living. Poverty is a relative term since what is regarded as poverty today would have been considered to be a state of modest comfort a century ago. Relative poverty is

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measured by taking into account the income distribution of the population in different fractile groups. Then, a comparison of the levels of living of the top 5 to 10 per cent with the bottom 5 to 10 per cent of the population reflects relative poverty. This in fact indicates the relative position of the different segments of population in the income scale of the society. If we take the concept of relative poverty, it can be shown that even the affluent countries are affected by poverty. The poverty line being fixed (say 50 US dollars per person per year), different expenditure levels will lead to different extents of poverty as shown in the following diagram. As the diagram shows, OP on the vertical axis is the minimum subsistence expenditure, which is 50 US dollars per capita. OE, OF and OG are the expenditure lines showing that the different levels of expenditure, given the fixed minimum level of subsistence expenditure, will give rise to different extents of poverty as denoted by OC, OB and OA on the horizontal axis. In the figure, the expenditure line OE has the lowest slope and, as such, denotes the largest extent of poverty followed by the lines OF and OG. The slope of the expenditure line OG being the highest, the lowest corresponding poverty OA is indicated. As a matter of fact, the higher the actual consumption expenditure, the lower becomes the poverty, and vice versa.

Extent of Poverty
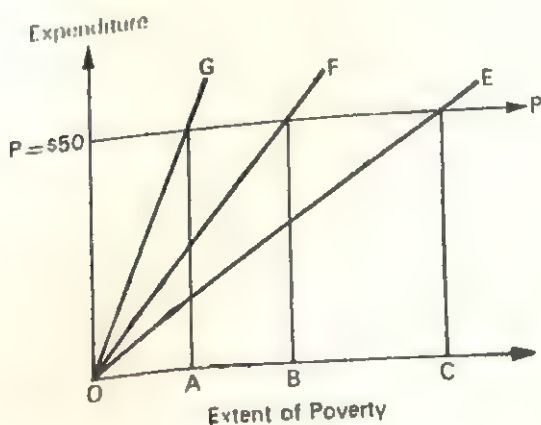
For calculating poverty, we can estimate the percentage of households of each given size lying below the poverty line through the method of linear interpolation. The percentage of households in poverty (X) has been calculated as under:

$$X = \left(\sum_{i=1}^{10} a_i b_i\right)/100$$

where, a= households in size group 'i' as a percentage of total households, b=poverty-stricken households in size groups 'i' as a percentage of all households in size group 'i', i=size of household (from 1 to 10).

The percentage of population in poverty (Y) can be estimated as:

$$Y = \left(\sum_{i=1}^{10} a_i b_{i,i}\right)/100.H$$

Where, H=average size of household.

The proportion of population of some LDCs whose income was below 50 US dollars can be shown as under:

Country	Income below 50 US dollars (1969)	
	Population million	Percentage of population
Columbia	3.2	15.4
Brazil	12.7	14.0
Peru	2.5	18.9
Latin America	26.6	10.8
Asia	320 .0	36.7
India	239.0	44.5
Pakistan	36.3	32.5
Malaysia	1.2	11.0
Africa	23.8	28.4
Tanzania	7.4	57.9
South Africa	2.4	12.0
Total of 44 LDCs	370.4	30.9

equality in their income distribution. It is found that DCs have a relatively more equal distribution of income than most LDCs. This is mainly because most economically advanced countries have been able to develop effective mechanisms to transfer some proportion of their incomes from the rich to the poor. The LDCs have a significant variation in their degree of inequality. There seems to be no apparent relationship between levels of per capita income and the degree of income concentration. Even within the group of very low income countries, the share of income going to the bottom 40 per cent varies from 6.5 per cent (Brazil) to over 20 per cent (Taiwan).

We give on p. 131 a chart showing the income distribution of different percentile groups of Third World countries. The table shows a wide range of income inequality among the people of less-developed countries. The groupings correspond to high, moderate and low degrees of inequality. The inequality is caused by many factors such as unbalanced development, inflation, poverty, unemployment, underemployment, low productivity, and so on.

LITERACY AND QUALITY OF POPULATION

A : LITERACY

Human resources constitute the ultimate basis for the wealth of nations. The principal institutional mechanism for developing human skills and knowledge is the formal educational system. Education is a key factor for the rapid development of a country. All countries have committed themselves to the goal of universal primary education in the shortest possible time. Education is not only the fruit of contemplation but an instrument of change also. Knowledge is linked with literacy and a formal education system. The spread of value and attitude can most effectively be achieved through education. Economic development calls for some changes in the traditional pattern of education. It is not enough to speak of the necessity of education; it is important to specify the type. An industrially advanced society has more literacy. This is not accidental. A stagnant society has a traditionally stagnant scheme of education. In such a society, memory is given more value than inventiveness. But in a developing society, there is much greater orientation towards applied science in education.

Education is one of the important needs of life. A low degree of literacy is an obstacle to economic growth. Investment in education is a measure of the future development of a country. Formal schooling is a good index of a population's educational attainment. The most basic minimum measurement of educational status is the degree of literacy. But it is very difficult to measure the degree of literacy in accurate terms.

The world data on literacy are not meaningfully comparable. Some countries publish their literacy data by taking into account the population below four years of age, while others

exclude this category of children. Some other countries exclude the age below ten years for calculating literacy.

Definitions of Literacy

As a matter of convenience, literacy is defined as the ability to read and write one's name in one's own mother-tongue. A *literate* person is one who is able both to read and write. A person who can neither read nor write is called *illiterate*. A person who is able only to read but not to write may be called *semi-literate*. In India all those persons who can both read and write a simple message with understanding in any language are classified as literate. This definition is proposed by the United Nations Population Commission. Many countries follow different types of definitions of literacy. For example, in Hong Kong, the definition is most liberal, whereas the definition is very strict in Finland. Thus, there is no universally accepted common definition of literacy. This poses a very serious problem in the analysis and comparison of international literacy patterns.

Literacy Differentials

Literacy patterns are different in different countries, and also in different parts of the same country. The varying literacy rates are to be found in the following spheres:

(i) The rural population has a lower literacy rate than the literacy rate of the urban population. The rural people do not get sufficient opportunities to get themselves educated in a formal way. The urban people, on the other hand, get sufficient opportunities for getting education. The urban population is socially more awakened and economically better off. The socio-economic pattern of urban places requires higher level of education for jobs and vocations. Moreover, the females in urban areas enjoy relatively higher status than their counterparts in the rural areas. Therefore, they get higher education and freedom. The gap between the rural and urban literacy rates, however, is gradually narrowing down.

(ii) Occupation plays an important role in literacy. Agricultural occupation does not require any formal education but occupations in the non-agricultural sector do require much higher level of literacy and education. Therefore, the people of non-industrial occupation have less formal education than the people of industrial and tertiary occupations. The people who are engaged in blue collar jobs require less education than the people who are engaged in white collar jobs.

(iii) The developed countries have a higher literacy rate as compared to the less developed countries. This may be due to many factors involving economic, social and cultural life. But the most important factor is the advanced technology and skill requirement in the productive activities of the developed countries as compared to the less-developed ones.

(iv) Generally speaking, males are more literate than the females. This is particularly true in the developing countries. In less developed areas, females are comparatively less free and do not have the opportunities for formal schooling. The females there have low status, lower mobility, lower freedom, early marriage and larger amount of domestic work. Moreover, female education in rural areas does not get social approval.

(v) Caste is also an important factor responsible for different patterns of literacy. For example, Muslims are less educated than the Hindus. Similarly, the scheduled castes are less educated than the non-scheduled castes. These castes are not only less literate, but on the whole are also economically more backward. The *Brahmins*, the priestly and teaching class, were given the privilege of reading and writing in our religious scriptures. The *Sudras* (the menial class) were at the lowest rung of the social ladder. In India, in ancient times education was made highly functional. The group which did not require formal education for its duty was denied education. The philosophy of imparting education only to those for whom it was of functional value became deeply embedded in Indian society.

(vi) The socio-economic status groups are also important considerations for literacy. People having better socio-economic status are more literate than people at the lower levels. This may be due to the necessity and capability of getting higher and better education. For instance, certain occupations like teaching, administration, health services and so on, have higher functional value of literacy. The socially and economically more awakened sections are more literate as compared to the backward people. The institutional structure also plays a decisive role in the matter of acquiring education.

(vii) Other things remaining the same, at developed stages of society, the literacy rate goes up and, at the backward stages of society, the literacy rate generally remains low.

Determinants of Literacy

There are many determinants of literacy. Literacy mainly depends on three factors—the willingness to learn, the ability to learn, and the learning institution. Early malnutrition and disease can adversely affect a child's ability to read, write and perform arithmetical operations and to think clearly and logically in school (his cognitive abilities). Children from poor families with low level of living are placed at a comparative disadvantage against the children of rich families. The following are the most important factors in the determination of a child's capacity to learn: (i) family environment, including income levels, parents' education, housing conditions, number of children in household, etc.; (ii) peer group interactions, i.e., the type of children with whom a child mixes; (iii) personality, i.e., the child's inherited intelligence and abilities; and (iv) early nutrition and health. If a child enters school deficient in all the above factors, the educational process will have little effect on him.

There is a positive correlation between the degree of economic progress and the degree of literacy. A civilised society will have a higher level of literacy than a tribal society. The rate of literacy diffusion, if low, can be an obstacle. Literacy and economic progress go hand in hand. But literacy is mainly

the product of the socio-economic milieu. In this socio-economic matrix will come many factors such as the value system, development of communication and transport, degree of urbanization, status of women in the society, development of technology, ethnographic set up, public policy and so on.

It has been found that there is a high degree of positive correlation between the degree of economic diversification and the pattern of literacy in a society. In many societies, literacy is acquired for getting suitable jobs in the market. A positive correlation also exists between the proportion of workers engaged in agriculture and the literacy pattern. A country which is mainly agricultural, will have lower literacy than a country which is predominantly industrial. In this respect, interesting comparison can be made between less developed countries and the developed countries.

Literacy will depend partly on the availability of opportunities for getting education, and the cost and benefit of such education in getting jobs and earning income. The larger the number of schools, the higher the rate of literacy, other things remaining the same. When the cost of education is very low, the rate of literacy goes up. The demand for education is dependent on its cost and the opportunities. As the availability of education is abundant, its demand also increases considerably. The demand for education will be inversely relative to the direct costs, as well as on the indirect or opportunity costs of education. When a person gets regular education, he is sacrificing his income which he could expect to earn during the years of his learning. This opportunity cost of education must also be included as a variable affecting its demand. The greater the opportunity cost of education the lower would be its demand.

The demand for education, and hence literacy, is dependent on the possibility of earning a higher wage in the modern sector as compared to the wage of the traditional sector. Literacy is positively relative to the modern-traditional sector wages differential. It also depends on the probability of success in finding modern sector employment. Since the probability of success is inversely related to the unemployment rate, one can argue that the demand for education will be low when

the educated unemployment rate is high in the country. The demand for education will in fact depend on the difference between the benefit and the cost of education. If the difference is positive and high, the literacy rate will be high. If the difference between these two variables is negative or zero, the demand for education would be absent. In less developed countries, the poor children are more likely to drop out because of the high cost of education, and high propensity of earning income.

The literacy rate is positively correlated with the standard of living and the level of income of the parents. If the income of the parents is high, the literacy rate in the family is generally very high. Poor parents cannot afford to give proper education to their children up to the desired level. Rather, the parents want their children to earn some income so that the total family income becomes sufficient for subsistence.

In the areas where transport and communication are developed and the movement of people is not restricted, the literacy rate generally goes up. Since the distances between a rural area and a town is not served by proper transportation facility, rural children do not get sufficient incentive to go and get education in the towns. This happens particularly in the less developed countries. The more urbanised places have higher rates of literacy as compared to the places which are less urbanised. The urban areas have higher demand for and also higher supply of education. The occupation structure in the urban areas necessitates higher learning than the occupation structure in the rural areas. The technological development in the urban areas is generally high. Educated people are required to create and diffuse the urban technology. This is another reason why urban people have higher education as compared to their rural counterparts. In technologically advanced countries, literacy rates are higher than those of technologically underdeveloped countries. Thus, there seems to be a positive correlation between literacy and technological development.

The value system in the society determines the attitudes towards learning. A traditional society does not believe in formal education. A higher degree of social awakening is essential for attaining higher literacy rate. Public policy is also oriented

by the existing value system. If the government is interested in diffusing education on a larger scale among the masses, the literacy rate is bound to go up. In many countries including the USSR, education has been made free and compulsory. The adult education programme can really go a long way to improve the rate of literacy in a country. The establishment of a larger number of educational institutions such as schools, colleges, and universities can be helpful for raising the literacy rate. The status of women in society also determines the rate of literacy. In a society where the status of women is higher, the rate of literacy is also generally higher. In less-developed countries, women's education is not generally favoured. It is pointed out that the proper place for women is in the kitchen. Ethnographic structure of a society is also an important determinant of literacy rate. A society inhabited by different groups of people having different cultures is capable of establishing different types of educational institutions and keeping alive the spirit of competition. This automatically leads to higher literacy rate.

As pointed out earlier, literacy (L) is influenced by many factors, such as literacy in the family (L_f), income of the parents (P_y). dependency load of the parents (D_l), stage of economic development (E_d). non-economic factors (n) like culture, attitudes and values towards life, ability to learn (a), willingness to learn (w), in institutions (i), state policy(s), and the positive difference between benefit and cost of education (b-c) and many other environmental situations (e), and a host of many other factors (u), which will include population pressure on land, technological development, wage differentials, demonstration effect and so on. Thus, the determinants of literacy can be conveniently expressed in the form of the following function:

$$L = f[L_f, P_y, D_f, E_d, n, a, w_s, i, s, (b-c), e, u]$$

Generally speaking, there is a very high correlation between parental income and literacy rate. The higher the parental income (dependency load being constant), the higher the

literacy of children, other things remaining the same. This is shown by the following diagram.
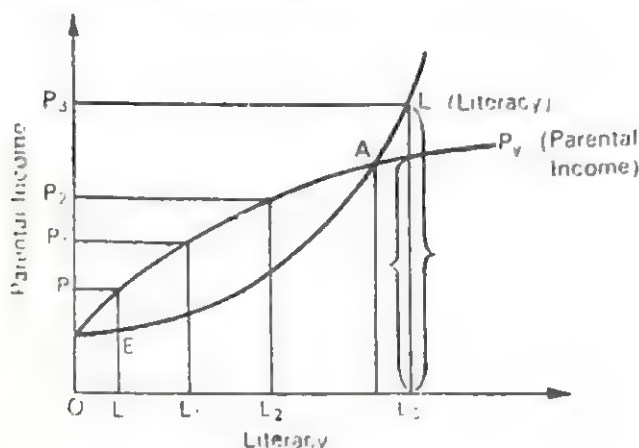
In the diagram, the parental income is taken vertically and the literacy rate is taken horizontally. At a low level of income like OP, the literacy level is also low OL but, at a high level of income, literacy would also be high. Thus, as income goes on increasing, literacy will also go on increasing. This situation will continue up to the point of equilibrium A where both these rates will coincide. After the equilibrium is crossed literacy would be much higher than the rate of growth of parental income. This is perhaps because the student will meet a large part of his educational expenditure from out of his own income once he gets a particular level of education, and also a particular level of income.

World Pattern of Literacy

The percentage of adults, persons of age 15 and over, who are illiterate has fallen since 1960 from 39 to 34 per cent of the adult population in developing countries. However, due to the rapid population growth, the actual number of adult illiterates has risen since then by nearly 70 million to an estimated total of over 800 million by 1975. The highest rates of illiteracy are found in Africa (73.7), and the Arab States (73 0), followed by Asia (46 8) and Latin America (23 6) In

North America and Europe, rates of illiteracy are a mere 1.5 and 3.6 per cent respectively.

The underdeveloped countries can be classified into three categories according to their illiteracy. In type one, there is high illiteracy (75 per cent and above). In this category, there are 41 of the 89 less developed countries for which data was available. These 41 countries consisted of 31 African countries, 9 Asian countries and one Latin American country. In the second category which shows medium illiteracy (50 per cent to 74 per cent illiteracy) there are 20 less developed countries. These include 11 African countries, six Asian countries and three Latin American countries. In the third type which represents low illiteracy (under 50 per cent), we have 28 less developed countries (17 in Latin America, 11 in Asia, but none in Africa). The proportion of illiteracy among the people of age 10 and above is shown in the following table:

Proportion of Illiterates (Age 10 and Above)

(per cent)

Country	Latest pre-War census	Latest census (1960)
Bulgaria	31	13
Chile	28	15
Egypt	85	77
India	91	76
Mexico	52	33
Portugal	49	34
Turkey	79	60

Source: Peter Cox, Demography, Delhi, 1979, p. 227.

It should be noted that most of the developed countries have an average illiteracy of only 5 per cent and under. USA has 95 per cent literacy.

B. HUMAN CAPITAL FORMATION

Importance

Human capital formation is associated with investment in man and his development as a creative and productive resource. It is a process by which knowledge, skills and capacities of the people of a country are increased.

It is now increasingly realised that the growth of tangible capital stock depends, to a considerable extent, on human capital formation. Several studies have shown that the growth of output in advanced countries has been significantly influenced by the improvements in intangible human qualities. Capital stock should be interpreted broadly to include the body of knowledge of the population and its capacity and training to use such capital stock effectively. Lack of skill and knowledge in underdeveloped countries is a severe limiting factor for economic development. An improvement in the quality of the human factor is therefore as essential as investment in physical capital. If the human capital formation is insufficient, physical capital cannot be productively used. In fact, physical capital becomes more productive if the supply of human capital is adequate in a country. Despite massive import of physical capital, underdeveloped countries have not been able to accelerate their rate of growth because of the insufficiency of human capital. The existence of surplus labour in such countries is to a large extent due to the shortage of critical skills. Moreover, the shortage of skilled labour is also very acute and this sometimes hampers production. This problem can be solved if human capital formation is given due priority. Economic backwardness may be reduced through the means of material capital but the more decisive means would be through human capital.

Schultz has demonstrated that even when a country possesses the physical capital and resources as the USA does, production would fall catastrophically if it does not possess sufficient human capital. There would be both low output and extraordinary rigidity of economic organisation until the capacities of the people are raised by investing in them. However, in many underdeveloped countries, the absorptive capacity for physical capital has proved to be low because the growth of

human capital has failed to keep pace with the accumulation of physical capital.

Schultz observes that in many countries where agricultural production has increased substantially, the main factor responsible for such increase is neither land nor physical capital. But agricultural transformation has been primarily based on new skills and improved knowledge.

According to Schultz, there are five ways of developing human resources.

  (i)   Health facilities and services,
  (ii) On-the-job training,
  (iii) Formally organised education at the elementary, secondary and higher levels,
  (iv) Study programmes for adults, and
  (v)   Migration of individuals to changing job opportunities.

Problems of Human Capital Formation

Human capital formation poses a number of problems. Is it possible to separate the consumption and investment part of expenditures on these activities? Can the particular resources entering into these components be identified and measured? Can the rate of return on investment be measured and compared with that of some other activities? Each of these questions poses serious problems and no completely satisfactory empirical procedure has yet been devised to answer these questions.

At what stage is the formation of human capital most needed? Western countries needed it more in the advanced stage of their industrialisation. But for underdeveloped countries, it may now be more necessary to have new skills and knowledge to take advantage of the more complex equipment and techniques which are being imported from abroad.

What types of education should be emphasised, to what degree, and how soon? As the absorptive capacity of the economy for educated persons is limited, an underdeveloped country cannot have an effective demand for a large number of educated workers. It is essential to determine what proportion of national income should be devoted to education. However,

from the point of view of rapid economic development, vocational and technical training and adult education should be given more emphasis than the expanded system of formal education. Lewis observes that secondary education is more important, because the products of the secondary schools form the social and economic backbone of a country. But, according to him, secondary education is given low priority in Asia Africa and Latin America.

Similarly, low priority is given to agricultural education in backward countries. In order to achieve a system of modern agriculture, the quality of labour in agriculture needs to be improved. The spread of education in the agricultural sector ensures two benefits:

(i) It prepares children to take up non-agricultural jobs in the towns, and

(ii) It makes the workers more efficient for using non-human capital.

As regards the growth rate of capital, it can be said in general terms that the rate of accumulation of human capital should exceed not only the growth rate of the working force but also the growth rate of the economy. However, the educational requirements may be assessed by making proper manpower surveys. It should be devised in such a way that after overcoming the immediate scarcity of technical personnel, the educational system should provide a balance between general education and vocational education and training.

Productivity of Human Capital Investment

Productivity of investment in human capital has been sought to be measured by two methods:

(i) The rate of return criterion, and

(ii) The contribution of education to gross national income or physical capital formation.

Becker, on the basis of the former criterion, estimated that the rate of return on total investment on college education in

the USA, for White males was 9 per cent in both 1940 and 1950. But the criterion of the rate of return involves a number of difficulties. On the basis of the second criterion, Schultz estimated that investment in education in the USA (1900-1956) contributed 3.5 times more than investment in physical capital. For India, P.R. Panchmukhi estimated that the total cost of formal education in India rose from Rs. 341 crores in 1950-51 to Rs 769 crores in 1959-60. These estimates, based on the second method, are more realistic because they measure the impact of educational investment on the whole economy. These estimates are based on the opportunity cost of education. But the second method. however, is not perfect. The calculation of foregone income is not so simple and involves a number of problems.

It is now realised that the growth of an underdeveloped economy is held back not so much due to the lack of physical capital as due to the lack of critical skills and knowledge; the latter limits the capacity of an economy to absorb physical capital productively. Investment in human capital however requires a different approach in developing countries. In the early phase of industrialisation, a developing country must concentrate more on informal functional education than on formal education which should be a distant objective. This effort would save both time and money and may prove at the same time most efficacious for improving the economic quality of human capital.

C: THE QUALITY OF POPULATION

Meaning and Importance

Qualitative demography is restricted to eugenics, the science of the transmission of hereditary features from generation to generation. The biological endowment of human beings, particularly the power of resistance to disease, is an important determinant of population quality. Quality of population refers not only to racial or biological differences but also to the differences arising from historical and cultural factors, environments, quality of health, nutrition, education and from the quality of leadership provided by the government and by

society. The quality of working population, including the rank and file of industrial and agricultural labour, technicians, managerial and skilled workers, is an important factor determining the rate of development. The quality of population is judged by health and education. Differences in health conditions found in different countries can be explained by environmental factors. Average levels of intelligence and various mental aptitudes and attitudes differ mainly because of environmental factors. It is the task of eugenics to help in bringing about a healthier and mentally better endowed population in a country by means of judicious selection of people. For raising productivity of labour, it is very essential that masses are literate, healthy, well-clothed, well-fed, and well-sheltered. In case the labour force is inefficient, it will not be possible to take full advantage of the rich natural resources, superior technology and huge amount of capital.

The quality of population in absolute terms is very high in backward countries but the problem of this increasing quantity is more accentuated by the lack of any attempt in improving the quality i.e., skills and education. Human beings are capital. Human capital formation is associated with investment in man and his development as a creative and productive resource. Capital stock should be interpreted broadly as the knowledge and skill of the population. An improvement in the quality of the human component is as essential as investment in physical capital. Underdeveloped countries have not been able to accelerate their rate of growth because of inefficiency of human capital. The absorptive capacity for physical capital can be increased by improving the quality of human capital. Human capital increases production, improves knowledge and attitude and speeds up development.

According to Prof. Schultz, there are five ways of improving the quality of a population:

(i)   Health facilities and services,

(ii) On-the-job training,

(iii) Formally organised education at the elementary, secondary and the higher levels,

(iv) Study programmes for adults, and

(v) Migration of individuals to changing job opportunity.

From the point of view of economic development, vocational and technical training and adult education should be given more emphasis than the expanded system of formal education.

Prof. P.R. Panchmukhi estimated that the total cost of formal education in India rose from Rs 341 crores in 1950-51 to Rs 769 crores in 1959-60. However, the poor economies cannot spend sufficiently for improving the quality of the population. Thus, the quality of population remains very low in most of the underdeveloped countries. The factors that cause deterioration in the quality of population are the factors which influence the social and economic life of the people.

Eugenic Programme

According to Gillin and Gillin, the physical defects of the population must be found first in order to improve the quality of the population. Mental and physical defects are of two types—inherited and acquired (environmental).

Eugenics is concerned with controlling the population, both quantitatively and qualitatively, by preventing mentally and physically defective people from reproducing. The social condition of a community can be judged positively by the standard of life to which it is habituated, and negatively by statistics relating to infirmities of body and mind, vice and crime. It is, therefore, essential to know the number of infirm people and the causes of infirmities.

(1) *Mental Defects.* Feeblemindedness, idiocy, imbecility, etc. are included in mental defects. Feeblemindedness implies that the persons concerned are not capable of responding normally to the stimuli of their enviroment. Idiocy is the lack of intelligence and the power of understanding. Mental disorder, which implies the improper functioning of the mind, may be either hereditary or acquired. Insanity is considered to be due to the prevalence of high temperature, sexual excesses, consumption of intoxicated substance, etc. Insanity affected on an average 34 persons per lakh in 1931. The areas of maximum insanity in India are either in or along the foothills; it was highest in Assam in 1931. The majority of illegitimate children in India are born of mentally deficient mothers. Prof. Thompson observed that schizophrenia and manic-depressive psychosis account for

nearly three-fifths of all hospitalised cases of mental disease in America. Many mental diseases are caused by some defect or weakness in heredity.

(2) *Physical Defects, Infectious and Contagious Diseases.* Blindness, club-footedness, T.B., deafness, dumbness, leprosy, S.T.D. (syphilis, gonorrhoea) can be included under this category. In 1931 there were 66 deaf and mute people, 172 blind people and 42 leprosy cases per lakh of population in India. In India, there are roughly three blind people for every 1000 of population. It is mainly due to lack of vitamin A. Blindness occurs most frequently in U.P., Rajasthan and Punjab. Out of 5 million cases of leprosy in the world (1936), about one million cases are found in India. In India, about 10-15 per cent people suffer from S.T.D. at some time or other during their life-time. S.T.D. cases are mostly found in big cities like Bombay, Madras, Delhi and Calcutta. Prostitution is largely responsible for the spread of these diseases.

The mental and physical disorders arise out of cacogenic elements which can be prevented by suitable eugenic practices. The aim of eugenics is to help the birth of mentally and physically healthy people. The people who are mentally and physically disturbed should be sterilised and they should not be permitted to reproduce. The eugenic programme should have two aspects—the negative and positive eugenics. While negative eugenics aims at preventing the mentally and physically disturbed people from reproducing, positive eugenics gives an encouragement to the growth of population of improved quality.

In America, acts were passed for compulsory sterilisation of the feeble minded people in 29 states in 1941 and 35,000 people of feeble mind were compulsorily sterilised. In India, a similar act can be passed by the government. The positive aspect of the problem of hereditary quality should consider the encouragement of more rapid growth of those who have good heredity. One way to encourage growth of such population where the stock is good, is to remove some of the penalties for having more children. Attempts should be made to encourage fair-sized families which can spend sufficiently to improve the

quality of the people by providing better education, food, medical facilities, etc.

In western countries, before marriage the partners have to have a medical check-up and when the doctors certify that they don't have any S.T.D. they are given a license for marriage. However, in India, no such medical examination is prescribed before marriage. But the Special Marriage Act and the Hindus Marriage Act allows a partner to legally separate himself or herself from the other partner in the case of serious diseases like S.T.D., T.B., etc. There are the following difficulties in implementing the eugenic programme in a country like India:

(i) Sufficient adequately trained people are not available to implement the eugenic programmes.

(ii) Medical facilities are not adequate.

(iii) In a vast country, it is difficult to implement the programme due to lack of finance and trained manpower.

(iv) Illiteracy and lack of knowledge of eugenics.

Natural Selection and Eugenics

According to some, natural selection works towards the improvement of the quality of the population, whereas artificial processes of selection lead to inferior heredity. According to Prof. Thompson, even in natural selection, there have been artificial social elements. It is probable that selection is more rigorous now in the industrial society. However, we must try to arrange matters so that the fittest to survive will also be the fittest socially. There is not much difference between the processes of natural selection made by the rich and by the poor.

Poor families have difficulties in implementing the eugenic programmes and improving the quality of members. Improvement in the social quality of our population depends very largely on removing the handicaps to good health, to decent living and to adequate education. For improving the quality of the population, the economic handicaps must be removed. This can be done by giving more facilities and incentives to the poorer sections of the population. The wide gap in opportunity

for health, for decent housing, for education, for recreation and for adequate income must not be allowed to remain.

Improvement of the Quality of the Indian Population

The quality of population to a very great extent depends on the level of literacy. From this point of view, the situation in India is very unsatisfactory. According to the 1971 census, the literacy rate was 29.46 per cent against 95 per cent in western countries. The literacy rate among females is lower than the literacy rate among males. The large difference in literacy rates exists not only between rural and urban areas and between males and females, but also among different states.

At present, life expectancy in India is 52.6 years as against 70 years in western countries. The lower life expectancy implies economic loss. The investments made in rearing and educating people cannot bear fruitfully as death occurs at an early age. The country can reap full benefits from the investment made in people only if they live longer.

In the Fourth Plan, 5.1 per cent of the total outlay in the public sector was devoted to education and 2.6 per cent to health, whereas in the Fifth Plan 4.6 per cent of the total outlay in the public sector was devoted to education and 6.0 per cent to health. All these show that low priority is given to investment in human beings. The private sector made an investment of Rs 100 crores on education and Rs 20 crores on health, during the Fifth Plan. Even in the Sixth Plan, the matter could not be improved much. In countries like the USA, the investment in education increased much more rapidly than in the formation of physical capital during the initial stages of development. But in India, the rate of growth of physical capital has been faster than that of human capital.

The two essential objectives of human investment are to allocate the right amount of resources and to get maximum returns from it. In order to achieve these aims, the following considerations are necessary:

(1) *Manpower Planning.* The demand for and the supply of manpower can be estimated. Then the rate of return of different categories of manpower is to be calculated, followed by calculations of resource requirements. These calculations of

resources required for human capital should then be studied in the context of resource allocation to other items in a plan, so as to make necessary adjustments, if required, with a view to promoting the overall objectives of planning.

(2) *Cost-Benefit Calculation.* The returns on human investment can be calculated by estimating costs and benefits of human capital. A number of difficulties will be encountered in this regard because both the costs and benefits of human capital are varied and difficult to conceptualise. However, such calculations have to be made in spite of these constraints.

(3) *Avoidance of Waste.* Wastage of resources involved in human capital formation should be avoided at all costs. Resources are being wasted in India in the production of arts graduates. Such resources to some extent could have been diverted to skill formation and the training of medical personnel and technicians. David Ovens has calculated that investments in agricultural and medical education and in family planning lead to higher benefits as compared to cost; but investment in undergraduate arts courses is uneconomic.

It must be noted that the quality of the population is related to the quantity of the population. The quality can be improved only when the quantity is controlled properly. While special demographic, social and economic investments are necessary for improving the quality of population, the importance of planned parenthood can hardly be over-estimated. Planned parenthood is an essential means through which the improvement of the quality of population has to be ultimately effected.

RURAL AND URBAN POPULATIONS

The terms 'rural' and 'urban' do not have any generally accepted precise meaning. In the USA, all people living outside incorporated communities having 2,500 or more inhabitants are classified as rural. But New England towns with fairly dense populations, although unincorporated, are classified as urban. The definitions regarding rural and urban population may very often change. The division between 'urban' and 'rural' is made at a different sizepoint in most of the countries. The agricultural population lives in the villages, and villages having well over 2,500 inhabitants are composed mainly of people engaged in agriculture. In the USA, an area with a population of less than 2,500 is considered rural, an area of more than 2,500 inhabitants is called urban. But this method of classification of rural and urban population is gradually losing ground. Urbanisation leads to concentration of socio-economic power and new type of problems associated with modernisation. This also gives rise to new kinds of spatial interaction. Urbanisation is regarded as an index of the level of socio-economic development of a country. It is in this context that the study of urbanisation assumes importance in population geography.

Urbanisation produces a new type of civilisation and a new culture quite distinct from those of rural societies. While it solves certain problems, it leads to some new ones. It is, therefore, necessary to identify rural and urban areas and their demographic differentials.

Rural-Urban Demographic Differentials

Cities have substantial excess of male population due to immigration. The rural population has a higher proportion of

female, and a higher proportion of both males and females in the younger and the older age groups. In the USA, the urban fringe population and the population of the densely settled areas around the cities, were classified as urban population. However, the rural areas are in the process of being urbanised. Therefore, the urban population is increasing in most of the backward countries with the progress of urbanisation. Cities of all sizes have substantially lower sex ratios. The population in the cities shows very great diversity of occupation. City people have more literacy, a higher education level and higher technical and professional training.

The shift of population from the country to the city is a characteristic feature of our time. With economic development, the occupation structure in a country changes, and more people are drawn from the agricultural occupation to manufacturing and tertiary occupations in the cities. This type of change in the occupation structure is, according to Clark and Fisher, an index of economic progress. When agriculture becomes more efficient, it can syphon off many people from the rural sector.

Fertility inversely varies with the degree of industrialisation and urbanisation. The fertility rate is higher, in general, in rural areas and lower in the urban areas. The more rural a state is, the larger is the number of children per 1000 women. Farm women have more children than non-farm women. The size of the family is also larger in the rural areas than in the urban areas. The age of marriage is higher in the urban areas, and lower in the rural areas. In urban areas, late marriage, longer time spent in education, better standard of living and so on keep down the fertility rate. In the rural areas early marriage superstition, traditional beliefs, illiteracy, and earning capacity at an early age, help to raise the level of fertility. The city women have congenial occupations besides home-keeping. The maintenance and rearing of children are more costly in the cities. Moreover, information regarding contraceptives are more widely disseminated in cities than in the rural areas.

Rural communities have generally lower death rates than urban communities. But, according to Prof. Thompson, during the last 25 years, the number of urban communities that have lower death rates compared to rural communities, particularly

at certain ages, has been increasing. A study made by Prof. Dorn with respect to Ohio in 1930, showed the lowest crude death rate for native White males in the largest cities, and the highest crude death rate in rural farm communities. The rural non-farm commumities and medium-sized cities had rates about midway between these other two groups. But when the rates were standardised for age, the above generalisation was reversed. The death rate for males showed a consistent decline from the large cities to rural farm communities.

In the USA, the crude death rates for rural communities were the lowest, followed by the largest cities, medium-sized cities and the small urban communities in 1940. However, at ages above 35, the larger cities had higher death rates than the smaller cities and the rural communities. Infant mortality is higher in the rural areas. The infantile diseases can be prevented and controlled in a better way in the cities than in rural areas. However, the death rates in the larger cities are higher than in the rural areas at older ages. There are some natural advantages in rural communities which can prevent chronic and organic diseases which develop late in life. Fresh air, fresh food, slower tempo of life, more space and so on are helpful in reducing the death rate in the rural areas. Thus, the expectation of life is higher in the rural areas as compared to the expectation of life in the urban areas.

The urban population is better educated than the rural farm population. Occupations in the urban areas require specialised professional training which necessitates a longer period for schooling, greater skill formation and a higher level of education. In the rural areas, education is considered as something unwanted. The marginal utility of education in terms of occupations in rural areas is low. The rural people especially in the developing countries do not get sufficient time and facilities for schooling. Even without any formal education, people engaged in farming can earn a living at a very early age. Obviously, therefore, the incidence of illiteracy is higher among the rural population.

The urban areas have a higher density of population as compared to the rural areas. The higher density of population

in the urban areas is due to better earning facilities, occupational diversity, cultural intercourse and so on in the urban areas.

Meaning of Urbanisation

Urbanization is the process by which villages turn into towns and towns develop into cities. However, there is no universally accepted definition of urbanisation. Different countries adopt different criteria for defining urbanisation or urban settlement. There is, however, no settlement which is completely urban or completely rural. There is no definite line of demarcation between urban and rural areas. Various countries give emphasis to the local conditions in classifying rural and urban areas. It should be noted that all urban places are not similar in character nor are they defined similarly. Thus, in Japan, urban municipalities having 30,000 or more people are granted urban status. In the USSR, urban status is granted on the basis of the size of population and degree of participation in non-agricultural activities. In the UK, a settlement is regarded as urban on the basis of the local government such as urban district, boroughs, and so on. In France, all communes having more than two thousand persons living in contiguous houses or with not more than 200 metres distance between houses are classified as urban. In Canada, cities, towns and villages having a population of one thousand or more are classified as metropolitan areas. In Ghana, all places which have a population of more than five thousand are treated as urban. In Sri Lanka, all settlements having municipalities, town or urban councils are treated as urban. Thus, we find that in different countries different criteria are used for defining urbanisation. This really imposes difficulties in scientifically studying urbanisation problems. The difficulty is particularly felt by population geographers who have to use mapping. Another difficulty that comes in the way of analysis is that in many countries, e.g., the Netherlands, Spain and so on, the areas are classified not into two but three urban, rural and intermediate zones, including the semi-urban areas and urban fringe.

In order to have a more or less uniform nomenclature the United Nations has classified the various definitions used by countries into five main types. They are as follows:

Type 1

This includes countries where municipalities, districts, communes, etc. have been recognised as urban areas.

Type II

This includes countries which grant urban status on the basis of a specific minimum size. The minimum size of population may of course vary from country to country, depending on socio-economic and cultural conditions.

Type III

Includes countries which grant urban status to an area if it has certain urban characteristics, such as good streets, aligned buildings, public services, electric light, court of law, police station and so on.

Type IV

Includes areas which are granted urban status if they have some form of local government, such as municipality, borough and so on.

Type V

Includes countries which grant urban status to an area if it has a particular proportion of its population in the non-agricultural occupations.

India has been following a criterion which is more or less equivalent to the one suggested by the United Nations (see, *Urbanisation in India* in this chapter, *infra*). However, following the United Nations, many countries have started classifying their urban settlements into a number of groups or types.

Process (Cycle) of Urbanisation

Urbanisation is a cyclical process through which a nation normally passes as it evolves from an agrarian to an industrial society. According to Lampard, the process of urbanisation involves three important aspects. These three elements are: behaviour, structure and demography. The behaviour aspect of urbanisation is concerned with the change in the fashion, manner and behaviour patterns of the inhabitants over time. The

structure involves the evolution of a particular type of economic structure of the population, mainly with respect to the occupations. The demographic situation involves the concentration of population in a few areas or localities. The behaviour pattern which arises from urbanisation is sometimes called *urbanism* by the sociologists. The term is not favoured by population geographers. Urbanism refers to the adoption of the urban way of life. This behaviour may be found even in the rural population. The theory of urbanism as given by Louis Wirth is based on the knowledge of social groups. It will lead to social separation and stratification. The structural change will induce people to shift from the primary sector to the secondary sector. Urbanisation therefore involves a change in the technology and method of production. It is concerned with more technical and mechanical methods in human activities. Lampard gives more emphasis on the change in the environment which is concomitant to urbanisation. In other words, urbanisation involves a whole process of change and the resulting consequences. When a society moves from the rural to the urban way of life, then many changes take place. This has been corroborated by Riessman. In fact, the society is converted from a small homogeneous unit to a large heterogeneous mass. This process of change brings in its wake a number of spatial changes and implications which are of interest to the population geographers. During the process of urbanisation the proportion of urban population to total population goes on increasing. This may happen by way of migration of rural people, expansion of urban settlements, change in the occupation structure and granting of urban status to many rural and semi-urban areas The increasing degree of population concentration is indeed a very conspicuous aspect of the urbanisation process. Gibbs considered five stages of population concentration during the course of urbanisation:

Stage I

Towns come into being; but the rate of increase of the rural population equals or exceeds the rate of increase of the urban population. The urban-rural ratio is largely influenced by food supply and by transportation technology.

Stage II

The rate of increase of the urban population exceeds that of the rural population mainly due to rural-urban migration, although the incentive is provided by improvement in food supply and transportation. In this stage fairly large cities with a high degree of division of labour emerge.

Stage III

Rural-urban migration exceeds the natural increase of the rural population.

Stage IV

As the volume of rural-urban migration decreases, the big centres exert a great attraction upon small towns, which become the new source of migrants. Their population ultimately dwindles.

Stage V

Concentration does not persist until all are congregated in one huge urban centre. As an excellent commutation system permits an increasing number who work in the city to live in the country, the rural society contains an ever larger proportion of urbanites. Rural non-farm population comes to increase as fast as the city population without a high degree of concentration, and so there is an outward movement from areas of high density. New urban centres may arise.

Gibbs states that the order will appear only without exception in closed population and that the stages are not mutually exclusive. A society may be in stage III and IV at the same time, but it is unlikely that it will enter stage IV before stage III.

Some may criticise the Gibb's theory on the ground that it lacks practical utility, because no population is completely indigenous and isolated, and none follows entirely the sequence hypothesized. However, the theory finds some validity in large national units.

In some advanced countries the end of the urbanisation cycle is now in sight, for while the number of urban people is still growing, their proportion in the whole population is near static,

or even declining. The rate of urbanisation began to slacken in England after 1861, in Belgium after 1910, and in Sweden after 1920. But the cessation of urbanisation does not necessarily mean a halting of city growth. It merely indicates that the urban population is growing only about as fast as the general population, or perhaps even slower.

According to Trewartha, there is a direct positive correlation between the degree of industrialisation and urbanisation. Urbanisation is a cyclical process. It has a beginning as well as an end. The curve of urbanisation is S-shaped. That is, urbanisation progresses slowly at the initial stage, then progresses rapidly, and finally it declines. At the final stage, urban people may prefer to live in the rural areas which are not very far off. The distance can be easily commuted. However, according to Peter Hagget, the S-shaped urbanisation curve may not be applicable to the LDCs. Such countries experienced urbanisation very late, and the process has been much more rapid in them as compared to the urbanisation process in European countries. The rate of urbanisation in LDCs is more or less 4 per cent per annum, whereas it was 2 per cent in the European countries. Secondly, migration in the 19th century very much influenced the process of urbanisation in Europe, but in the 20th century, urbanisation of the LDCs is mainly the outcome of the population explosion. Of course, in some countries, urbanisation has been considerably influenced by the process of rural-urban migration. Thus, it is clear that the old urbanisation process is different from the new urbanisation process being experienced by LDCs of our times. The urbanisation process has various dimensions involving change in occupation structure, production pattern, consumption pattern, urban-rural population ratio and so on. The dimensions have physical, social, cultural and economic configurations. Urbanisation involves centrifugal and centripetal forces. Whereas a centripetal force tends to agglomerate economies, a centrifugal force tends to restrict concentration and favour dispersion of men and materials. An optimal situation can be achieved by properly combining the centralising and decentralising forces in a most rational way. In the LDCs, the centripetal forces are still at work, whereas in DCs, centrifugal forces do seem to operate.

Thus, these two types of countries have different forces working in them. As a result, the degree of urbanisation becomes different. Needless to say, there are different degrees of urbanisation, and there is an optimum urbanisation point beyond which urbanisation will prove uneconomical. Hence, it is necessary to understand the measures of the degree of urbanisation.

Measures of Degree of Urbanisation

The degree of urbanisation gives the extent to which the population of an area is urbanised. There are many methods for measurement of urbanisation. The following are some:

(1) *Lorenz Curve and Gini Concentration Ratio*: This method is helpful for preparing an index of urban concentration. The Lorenz curve, along with Gini concentration ratio, may prove to be a very useful method of measuring urbanisation. In the Lorenz curve, the units (cities) are depicted individually or groupwise in class-intervals on the vertical axis (Y), and the cumulative percentage of population is depicted on the horizontal axis (X). A diagonal line at 45° is drawn to show the perfect position of distribution. The greater the departure of the Lorenz curve from the diagonal line, the greater the disparity in size, and the higher the degree of urban concentration. The Gini concentration ratio is the measure of the proportion of area lying between the Lorenz curve and diagonal in the total area of the triangle. In the next figure, the Gini

Gini Coefficient =
$$\frac{\text{Shaded Area 'A'}}{\text{Total Area 'BCD'}}$$
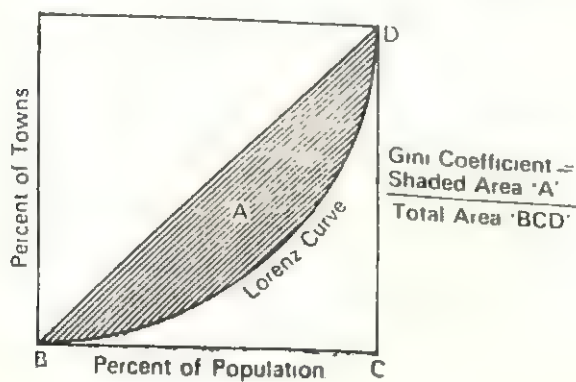
concentration ratio is given by calculating the ratio of the 'area' between the diagonal and the Lyrenz curve as compared to the total area of the half-square in which the curve lies. In our diagram, this is the ratio of the shaded area 'A' to the total area of the triangle BCD. This ratio is known as the Gini concentration or, simply, the Gini coefficient.

The maximum value of Gini concentration ratio can be 1.00. This implies that the entire urban population is concentrated at one point. The values may very between zero and one. The lower the value, the more scattered is the urban population. Value lying between 0.50 and 0.70 will mean a high degree of concentration of urban population in big cities, as is found by many empirical studies. The Gini concentration ratio may also be calculated in the following way:

$$G = (\sum_{i=1}^{n} X_i \cdot Y_{i+1}) - (\sum_{i=1}^{n} X_{i+1} \cdot Y_i)$$

where G = Gini concentration ratio, X_i = cumulative proportion of population, Y_i = cumulative proportion of cities (units), and n = number of class intervals.

(2) *Urban Density Index*: This is a measure of urbanisation. Urban density is calculated by dividing the urban population by the total area of the region. In other words, $U_D = \dfrac{P_c}{A_t}$, where U_D = urban density, P_c = urban population, A_t = total area of the region.

The urban density approach can tell us about the density of population which is a fairly good index of comparison.

(3) *Percentage Distribution Method*: According to this method, the level of urbanisation is defined as the proportion of total population residing in urban places. This method can be found by a ratio of urban population to total population. Thus,

$$U = \dfrac{P_c}{P_t}$$

where U is urbanisation, P_c is city population, and P_t is total population.   As long as this ratio increases, urbanisation also increases.   However, as pointed out by Gibbs, this method is a one-dimensional method, because two places having the same ratio value may have quite different size structures.   Therefore, Gibbs has suggested that the following two methods may supplement the *percentage distribution method.*

(4) *Scale of Urbanisation Method.* The scale of urbanisation (U_s) is given by the following formula:

$U_s = \Sigma \ a_i. \ b_i$, where a_i=proportion of urban population in size class (i) and all size classes above it, b_i=proportion of total population in size class (urban) (i) and all classes above it.

(5)   *Scale of Population Concentration Method.* The scale of population concentration (P_s) is calculated in the following way:

$$P_s = \Sigma c_i$$

where c_i=proportion of total population in size class (i) and all sizes above it.

The above two measures (4 and 5) along with the percentage distribution method can provide a better index of urbanisation, according to Gibbs.

(6)   *Median Value Method.* The median value of the size of urban places has been used as a method of measurement of the degree of urbanisation.   The median value is the size of a city which falls exactly at the middle, if all the cities are arranged in an order.   That is, the median value divides the total figure into two equal halves, one line above and the other line below. The median value can be calculated for the urban population also.   However, some authors have suggested the calculation of the mean value instead of the median value.   According to Arriaga, the weighted average mean value with the percentage of urban population method can give a very good index of urbanisation.   Some authors have favoured the use of average size along with average spacing as a measure of the degree of urbanisation.   The average size of the urban centre can be calculated by dividing the total urban population by the number of urban units.   This method can denote the size of an urban place in relation to another.

(7) *Average Spacing Method*. The average spacing method is based on an assumption that the area being served by an urban centre is circular in shape. The average spacing can be calculated by dividing the total area of a region by the total number of its urban centres. The spacing can be calculated by solving the following equation:

$$\pi R^2 = A$$

where A = area being served by the urban centre, R = radius of the urban circle. It is easy to calculate the value of R. The average spacing between two urban places will be equivalent to 2R. The spacing method can be regarded as a good index of urbanisation.

(8) *Primacy Index of Urbanisation*. Jafferson first introduced the concept of primate (largest) city. He originally considered a primacy index of two cities, but later on introduced a four-city primacy index as the following:

$$\frac{P_1}{P_2 + P_3 + P_4}$$

where P_1 is the population of the largest city, P_2 is the population of the second largest city, P_3 is the population of the third largest city and P_4 is the population of the fourth largest city. The higher the primacy index, the greater is the degree of urban concentration. It is to be noted that urban primacy develops due to high centripetal tendency.

(9) *Rank-Size Method*. The inverse correlation between the number of urban places and the size category has been noted by some writers. This implies that the number of small-sized urban places is the largest and the number goes on decreasing as the size level increases. Auerbach observed that when the large cities are ranked according to their size the product of a city's rank by it size tends to remain constant. The rank-size method was formulated in a better way by G.K. Zipf whose method is given below:

$$P_r = \frac{L}{D_r}$$

where P_r is the expected population rank 'r', L is the population of the largest city and D_r is the rank of the city in the descending order of cities.

The method reveals a harmonic progression of cities within the urban hierarchy such that if the population of the largest city is known, it is easy to calculate the expected population of all other cities through the rank-size method. The method states that one can expect the population of the largest city to be six times the size of the sixth ranking town in the region. However, Stewart found that the relationship was more varied than what was expected according to the method. He of course observed that the larger the country, the lower was the ratio. Stewart says that the divergence from the method is greater in the case of well-populated, homogeneous smaller cities. It is however very difficult to relate the existence of rank-size relationship with the general spatial features of a country, as Berry holds. Lognormal distributions typically hold good for large cities having a long tradition of urbanisation.

The above methods of measuring the degree of urbanisation cannot however be made applicable to all cases. A particular method will have to be selected on the basis of its suitability. For example, if the purpose is to observe the trend of the growth of very large cities, the procedure will be primacy index method. Lorenz curve and Gini concentration methods will be helpful for studying urban concentration. The percentage distribution method can be of use to measure the regional imbalances in urban development. If the purpose is to study the trend of the growth pattern of cities in relation to their sizes, the appropriate procedure would be rank-size method. Thus, it would be wise to find out the most appropriate method of measuring the degree of urbanisation with reference to the purpose of study.

Determinants of Urbanisation

Urbanisation depends on many inter-related factors which are social, economic and cultural in nature. The factors which mainly affect the urbanisation process are given below:

(i)   Urbanisation depends on the growth of urban functions.

The urban way of life, behaviour pattern, production method and so on are positively correlated to the growth of urbanisation.

(ii) The economic factors such as the non-agricultural occupation, the growth of sophisticated technology, factories and places of production, increasing commercialisation, diversification of the economy, growth of large-scale industries, mechanized methods of production and so on are responsible for urbanisation.

(iii) Demographic factors like excessive growth of population, rural-urban migration and so on may lead to the growth of urbanisation.

(iv) Socio-economic awakening, change in the value pattern, attitudes, stage of development and public policies may contribute to the growth of urbanisation.

(v) Urbanisation is positively correlated to industrialisation and economic development.

(vi) Countries on the nadir side of development may experience rapid development in transport and communication. This brings about better contact and greater scope for urbanisation. The countries which are at the zenith will gradually experience the last stage of urbanisation when people will start moving out to the rural areas. Therefore, it will suggest less urbanisation.

(vii) Construction of railways, better mobility, better business prospect, better transport, better banking and financing facilities, better managerial talent and so on.

(viii) Growth of new industries.

(ix) Development of trade and commerce.

(x) Landless labour class in the rural areas.

(xi) Decay of village industries.

(xii) Better facilities, amenities and job opportunities in the cities.

(xiii) Availability of white-collar occupations in the cities.

(xiv) Chance of lucky break in cities.

(xv) High pressure of population on land in the agricultural sector.

(xvi) Comparative disregard for rural life and agricultural and manual occupations. In the larger cities, the growth

of population prior to the industrial revolution was mainly due to the migration into them.

(xvii) The development of focal points or growth poles for the diversification of the economy or for providing facilities for growth will create conditions for urbanisation.

Urbanisation in India

In India, the trend towards urbanisation started in the 19th century. Famines, partition of the country, railway construction, epidemics, decay of handicrafts, growth of new industries, trade and commerce, the creation of a landless labour class, settlement of landlords in towns, and backwardness of villages were responsible for urbanisation in India. But the process of urbanisation was very slow in India in the past. More investment was made in the rural sector, and investment in construction and housing in cities has not been substantial. But still, a few statistics support well the trend towards urbanisation in India.

In the 50 years between 1921—71, whereas the urban population increased four times, the rural population only doubled itself. The proportion of the urban population has increased from 11 per cent in 1921 to about 20 per cent in 1971. This means that out of every five Indians, one lives in a town. Fifty years ago, for every 9 Indians, one was an urbanite. The unadjusted growth rate of urbanisation was 26.4 per cent for the decade 1951—61. However, there was wide variation in the states' growth rates which ranged between 9.9 per cent for U.P. and 122.5 per cent for Assam. The rural-urban population ratios in India over the years are shown in the following chart.

Rural and Urban Population (%)

Year	1921	1931	1941	1951	1961	1971	1981
Rural	88.6	87.9	86.1	82.7	82.2	80.1	76.3
Urban	11.4	12.1	13.9	17.3	17.8	19.9	23.7

The above chart shows gradual increase in the percentage

of people living in India's urban areas. In the 1971 census, the definition of urban area adopted is as follows:

(1) All places with a municipality, corporation or cantonment or notified town area, or

(2) A minimum population of 5000 in an area.

(3) The area where at least 75 per cent of the male working population is non-agricultural, or

(4) An area having a density of population of at least 400 per square kilometre.

The urban population has grown in absolute terms from a figure of 26 million in 1901 to 159 million in 1981. In relative terms, the ratio of the rural population to the urban population has come down from 8.2:1 in 1901 to 4.0:1 in 1971. The proportion of the urban population in class I towns with a population of over one lakh has increased from 22.9 per cent in 1901 to 52.4 per cent in 1971. This shows that there is a trend towards concentration of population in the bigger towns. But the population in class II and III towns, has remained almost constant, whereas the relative proportion in class IV, class V and VI towns, has come down sharply. There are eight large cities in India, each with a population of over 10 lakhs. Urbanisation in India has been progressing at a slow but steady rate. The number of towns, along with population, are shown below:

Towns with population	Number in 1961	Number in 1971	Number in 1981
I. Population less than 5,000	218	277	230
II. Between 5,000 & 10,000	760	756	742
III. Between 10,000 & 20,000	748	931	1048
IV. Between 20,000 & 50,000	484	617	739
V. Between 50,000 & 1,00,000	139	198	270
VI. 1,00,000 and above	113	142	216
Total	2,462	2,921	3,245

Metropolitan towns are growing at a much faster rate than the normal growth of population in India. Whereas in India, 19.9 per cent of the population lives in urban areas, it is 73.6 for Canada, 59.9 for the USA and 55.8 for the USSR. In other countries, urbanisation was the consequence of large-scale production, growth of industrial civilisation and the introduction of machinery.

There seems to be a positive correlation between the degree of urbanisation and the per capita income. A higher per capita income tends to be correlated with a higher percentage of urban population to the total population. A high degree of urbanisation is found in states like Maharashtra, Tamil Nadu, Gujarat, and West Bengal. These states received most of the public sector projects and other industrial projects of national importance. These states are also important for the development of overseas trade on account of their having important ports. But industrialisation in India could not significantly absorb the rural population. Therefore, the migration from rural to urban areas is not conspicuous.

However, there are more people in towns than can find jobs, education, medical facilities, accommodation and the like. The pace of urbanisation is faster than the rate of industrialisation and the rate at which other facilities are expanding. Urban areas in India have many problems, such as unemployment, slum areas, violence. etc. Thus, to cope with the problems of the urban area, measures at least in three directions are required:

(1) Efforts should be made to expand and improve the facilities relating to education, medical and health services, and housing in towns.

(2) Living conditions in the rural areas should be improved. Drinking water, medical and health services, electricity and elementary education should be made available in rural areas in the shortest possible time to reduce the attraction of towns.

(3) New small industrial townships should grow near the rural areas, wherefrom ideas and improved pactices can spread to the rural areas.

In this way, we can avoid the pressure on big cities. In a country like India, a large number of medium-sized cities could be more helpful than a small number of very large cities. What is required is the ruralisation of urban areas and urbanisation of rural areas.

Trends in World Urbanisation

The urban process is not new. The earliest cities had their beginnings about 5,500 years ago. There was, however, slow rate of urbanisation before the Industrial Revolution in the West. It is estimated that nearly 3 per cent of the world's population was living in towns of over 5,000 population and 2.4 per cent in cities of 20,000 and over in 1800. The second figure went up to 4.3 per cent in 1850, and it more than doubled between 1850 and 1900 (9.2 per cent). The figure went up to 20.9 per cent in the first half of the twentieth century, and the rate of change from 1950 to 1960 was twice that of the preceding 50 years. In 1970, the proportion of the world population living in urban areas is estimated to have been about 37 per cent, and in 1980 the percentage was still higher. However, the LDCs are less urbanised than the DCs. Most countries which have a high G.N.P. and are industrialised, are also characterised by a greater degree of urbanisation. In Europe (excluding the Soviet Union), the urban population is between 40-45 per cent of the total population. In the other more developed regions of North America, the Soviet Union, Japan, Australia and New Zealand, the urban population is between 50-55 per cent of the total population. In the less developed regions of Asia and Africa, the urban population accounts probably for only about 13 to 20 per cent. But within the Asian region, the more developed countries have higher levels of urbanization. Japan with a G.N.P. per capita of dollars 1000 has 83 per cent of its population in the urban areas. Iran with a G.N.P. per capita of dollars 200-500 has a 39.3 per cent urban population, Philippines and Vietnam with about dollars 100-200 G.N.P. per capita have a 23 per cent urban population, and India, Indonesia and Pakistan with less than dollars 100 G.N.P. per capita have between 15 and 20 per cent urban population. It appears from the above data that there is a positive relationship

between urbanization and economic development. On the basis of the percentage method, the urbanisation rate of some countries may be shown as under:

Country	Year	Per cent of city population to total population
UK	1968	78.9
Canada	1966	73.6
France	1968	70.0
USA	1960	69.9
Japan	1965	68.1
USSR	1960	55.8
UAR	1966	41.6.
India	1981	23.7
Pakistan	1961	13.6

It is clear from this table that the urbanisation process has proceeded unequally in the world. The achievement of a high level of urbanisation in Africa, Asia and Latin America, has to await industrialisation. However, urbanisation is gathering momentum in LDCs. According to the United Nations (1960), 25 per cent of the population of LDCs was urbanised; by 1970 it rose to 27 per cent. By the year 2000, it is expected to go upto 40 per cent. The data obtained for 59 LDCs, which represented 48 per cent of the total urban population of LDCs, the following classification was made by the United Nations:

1. *Low Urbanisation* (20 per cent and below urban population): In this group fell 39 countries out of a total of 59 (25 in Africa, 6 in Latin America, and 5 in Asia, including India and Pakistan.)

2. *Medium Low Urbanisation* (20-29.9 per cent urban population): In this category, there were 16 LDCs (7 in Latin America, 5 in Africa and 4 in Asia).

3. *Medium High Urbanisation* (30-39.9 per cent urban population): In this category there were only seven LDCs (3 in Latin America, 2 in Africa, and 2 in Asia).

4. *High Urbanisation* (40 per cent and over urban popula-
tion): 2 countries (Venezuela and Chile) fell in this group. Chile
was a marginal case. The combined population of these two
countries was 19 million only.

A projection of urbanisation made by Hoyt Devis and others
assumes a great growth of towns in the developing world, so
that by A.D. 2000, the proportion of the population in them
should be as high as it is in the DCs of today. The calculation
made by Hoyt is given in the table that follows:

Projected Urbanisation

Countries	Population in millions in localities with 20,000 +		Percentage in localities with 20,000 +	
	1960	2000	1960	2000
Asia	355	1934	21	50
Africa	38	165	15	32
Latin America	92	355	45	60
North America	166	281	84	90
Europe	341	682	54	70
Oceania	10	19	63	65
World	1,002	3,416	34	54

Source: H. Hoyt, *World Urbanisation*, Washington, 1962 p. 48-9.

Accelerating urbanisation is fast becoming a general trend
in developing countries. It results from a combination of rapid
natural increase caused by declining mortality, growth of indus-
tries in towns, and rural-urban migration in search of new
openings. The growing pressure upon land and the inability of
the traditional modes of agriculture to support the growing
population has tended to drive many villagers to the city.
Urbanisation is, in a sense, more a reaction against the lack of
vigorous economic growth than a response to rising level of
income per capita. Instead of being a symptom of growth, as it
was in the West, urbanisation in South Asia primarily is an
aspect of continued poverty.

POPULATION AND RESOURCES

Conceptual and Operational Problems

A country cannot always maintain a balance between population and resources. The population-resource ratio may be high, low or in balance. An underdeveloped country is faced with the problem of high population growth. It cannot maintain the balance between population growth and resources. A developed country has a high resource-population ratio. Even the same country may have different areas having different population-resource ratios. The imbalance between population and resources may be caused by high rate of growth of population and low rate of growth of resources, or low rate of growth of population and high rate of growth of resources. The first type of imbalance is more serious and is experienced by the less developed countries. The imbalance is not simply caused by population or by resources alone. The nature of the economy, the stage of development, the technology and many other factors are responsible for such an imbalance.

It should be noted that there are physical as well as human resources in a country. Human beings are resources. Resource does not simply mean a substance or a thing; it refers to the function which a thing or a substance may perform in order to attain a given objective. Production is always the result of an interaction between man and nature. Some people would like to include people in the resources of the country. In such a case, the dichotomy between population and resources becomes meaningless. Most of the resources are also discovered and utilised properly by human beings. Thus, in the analysis of the resource-population ratio, the role of population cannot

be ignored. This is why Ackerman wanted to introduce technology as a factor in the study of population and resources. Zelinsky wanted to include the physical and biological potentials of soils, biota, water and climate in resources. But still, resources cannot be properly quantified. And the problem remains.

There are many problems connected with the study of population and resources. Firstly, it is difficult to quantify the exact amount of resources a country possesses at a particular point of time. Secondly, it is not yet settled whether human beings should be included in the resources or not. If they are included, then the study of population and resources becomes meaningless. Thirdly, all the resources are not locally produced: still, a country may have sufficient amount of them. Fourthly, a country may have sufficient resources but they may not be utilised properly. Fifthly, a country may be poor in one type of resource but rich in another type of resource. Sixthly, it is equally difficult to make an assessment of the population factor because population differs in quality. Seventhly, different people will have different abilities levels of productivity. Their consumption, savings and investment capacities may also be different.

For all the above reasons, it is difficult to find out a proper relationship between population and resources. This is perhaps the reason why a clear idea about the population-resource relationship in a country cannot be ascertained at a particular point of time. But it is very essential to have a clear idea about such a relationship in the context of growing population and economic and social development.

Population Growth and Resource Development: Population Pressure

Before a point of time, population growth stimulates economic growth. For example, in the early 19th century, rapid growth of population stimulated economic growth of England and other European countries by providing the much needed labour supply for industrialisation. In sparsely populated areas, any rise in population is welcome. Population growth has many beneficial effects such as increase in the labour force,

better exploitation of resources, higher effective demand, lower wages, higher profit and investment and so on. As Boserup has observed, in many countries agricultural development was possible because of rapid growth of population. Agricultural development is both a cause and an effect of population growth.

However, after a point of time, population growth adversely affects economic development. This is particularly true of backward countries where the rate of growth of population is very high, and the population-resource ratio is too high. In such economies, population growth has created additional obstacles to economic development. These economies are poor, capital-scarce and labour-surplus. The adverse effects of population growth are summarised below:

(1) Since national income has to be distributed among a very large number of persons, per capita income becomes lower when the population increases. From this, many other associated unfavourable effects follow—low saving, low investment, low output, etc. In India, national income has increased roughly at a rate of 4 per cent during the Fourth Five-year Plan. But per capita income has increased only at a 0.5 per cent rate.

(2) Population growth puts heavy pressure on the limited supply of land and, as a consequence, the law of diminishing returns follows. According to Prof. Nurkse, marginal productivity of labour becomes zero in such a situation. In India, per capita availability of cultivated land was 1.1 acre in 1911, and 0.6 acre in 1971. The density of population also becomes higher when the population increases. The density of population was 90 people per square kilometre in India in 1931 whereas it is 178 people in 1971. Thus, the man-land ratio has become higher and there has been uneconomic sub-division of land.

(3) Population pressure lowers the standard of living because the supply of output cannot be increased sufficiently due to lack of complementary factors. With

increasing demand, prices increase and it creates hardship for the poor people. Poverty breeds poverty and the vicious circle is accentuated. In India, it has been estimated that to bring about an increase of 5 per cent in per capita income, an investment of 30 per cent will be required. This is impossible for a poor country.

(4) Rapidly growing population necessitates larger investments in social and public welfare, housing, transport, health and other social infrastructures. Prof. Zaidan has estimated that for an underdeveloped country like India, 10 per cent capital accumulation is essential to keep the per capita income at a constant level. It is estimated that for every one per cent additional population, 4 per cent investment would be essential in order to maintain only the existing level of living. This demographic investment, which is unproductive, will be higher if population growth is higher. Thus, lesser amounts of investment would be available for economic development.

(5) Growth of population leads to food scarcity. Therefore, a large part of the country's resources has to be diverted for importing food. Till recent years, India had to import a huge quantity of foods for feeding its teeming millions.

(6) Population pressure changes the consumption pattern of the people because other things remaining the same, the per capita availability of the consumption article becomes less. Consumption expenditure per capita per month was below Rs 40 in 1975 in the case of 30 per cent of the Indian population. The per capita calorie intake of an average Indian in 1940 was too low whereas the minimum should be 2300 per person per day. Thus, a high rate of growth of population in a country like India impairs the health and productive efficiency of the people.

(7) A high rate of growth of population produces unemployment and underemployment, both open and disguised. The extent of unemployment in India was . 220 lakhs in 1971. Similarly, underemployment has

been estimated to be of the order of 10 to 15 per cent (according to Prof. Raj Krishna's study based on N.S.S. data). Unemployment as a percentage of total labour force was 10.4 in India in 1971, and disguised unemployment is roughly to the extent of 20—25 per cent of the labour force.

(8) With increasing population, children and old people in the society would be larger in number than the people in the working age group. This means a very high dependency load. Every 1,000 self-supporting persons in India have to maintain 2,504 dependents as against 1,547 in the USA, and 1,207 in the UK. The effective labour force is reduced when population is growing rapidly but, at the same time, the burden on the economy increases because more money has to be spent on public health, medical care, nutrition and education of these unproductive consumers. In India, the unproductive consumers (dependents) were 251 million, or 57 per cent in 1961.

(9) Rapid population growth reduces capital formation. The low rate of capital formation keeps the level of technology at a low level, and rapid progress is hampered. Capital formation is adversely affected by the diversion of resources from productive activities to current consumption.

(10) A rapid rate of growth of population generally necessitates increasing imports of consumer goods; but, at the same time, the export surplus becomes lower due to the increase in domestic consumption. Therefore, the balance of payment position deteriorates.

(11) A rapidly growing population requires increasing investment in social infrastructure like housing, medical care, education etc. Prof. Coale and Hoover have estimated that the Government of India's programme of compulsory basic education in the age group of 6-13 years by 1981 will involve an expenditure of Rs. 20-25 billion on the assumption that population in this age group will rise to 43 million in 1981. Housing would cost Rs. 40.7 billion by 1981.

(12)   With increasing population, pressure of population on lands increases, man-land ratio becomes higher, per capita income and productivity get reduced and lands are fragmented. Agriculture becomes an uneconomic activity and the use of improved techniques and better methods of production cannot be introduced. Prof. Nurkse observed that it is rather hopeless to try to introduce better farming methods unless the excess population is drained off first.

Thus, it becomes clear from the foregoing discussion that excessive rate of growth of population is not a help but a hindrance to rapid economic growth. However, it appears more reasonable to consider the question of population growth in relation to the level of utilisation and the supply of resources, than to consider the absolute notion of population. Dr. Joshua Leaderberg has rightly pointed out that it is not any global limitation of physical resources that makes the world seem overpopulated today but the way in which those resources are used or not used.

The effect of population growth on economic development is a function of five variables: (a) changes in the amount of labour, (b) changes in the amount of capital, (c) factor returns, (d) economics of scale or output, and (e) innovations and technology. Prof. Horace Belshaw has studied the effects of the interactions of these variables with the help of the famous Cobb-Douglas equation which is expressed as:

$$P = bL^k. C^j$$

where P, L and C are output, labour and capital, b is a constant, different for different economies, and K and J are exponents of labour and capital respectively, and indicate a proportionate change in output (P) for a given proportionate change in the factor (L or C).

His analysis of the effects of the interactions of the above variables on economic growth has led him to the conclusion that a rise in the levels of consumption in a growing population would require one or more of the following conditions:

(a) A rate of increase in capital stock (i.e., rate of investment) exceeding both the rate of increase in population and that in national income.

(b) Economics of scale large enough to effect such diminishing factor returns as might occur if the rate of growth of population exceeded that of capital stock.

(c) An improvement in the ratio of labour to population.

(d) Improvements in the efficiency of labour and/or capital. It is abundantly clear that none of these conditions exist in the developing economies of today. Although most underdeveloped countries are seriously inclined to achieve rapid economic growth, their determination is beset by such problems as excessive rate of population growth, unfavourable age structure, unbalanced distribution of population, immobility of manpower, inadequacy of trained manpower, low physical efficiency, underemployment, institutional resistance and cultural inertia.

Population Growth and Investment Requirement

Population growth at a high rate accompanied by low growth of income leads to a high rate of investment requirement. Thus, when the rate of growth of population is very high, investment required would also be very high for maintaining the economic growth. This will result in more and more pressure on the existing resources. This can be shown from the following table:

Population growth rate %	Growth in per capita income %	Growth in GDP %	Capital Output ratio %	Investment required %
2.5	0	2.5	3:1	7.5
2.5	1.0	3.5	3:1	10.5
2.5	3.0	5.5	3:1	16.5
2.5	7.0	9.5	3:1	28.5

It is clear from the foregoing discussion that equilibrium between population and resources is a rare phenomenon. Imbalance between the two is a more common situation. The maladjustment between resources and population, if unfavourable because of high population resource ratio, leads to population pressure. The nature of such pressure will, however, vary from time to time and place to place. This is so because population pressure is a function of ecological, economic, social, cultural, and historical variables. Population pressure is the outcome of an interaction among three variables, e.g., resources, population, and the expectations pattern. According to Mabogunje, population pressure will occur under the following situations: (i) when resources and population are low but expectations are high, (ii) resources and expectations are low but population is high and (iii) where resources are low but population and expectations are high.

Mabogunje's analysis is not very useful because the three variables mentioned by him are not quantifiable so as to make them operationally meaningful. Thus, it is obvious that, at a micro level, it is very difficult to operationally conceptualise the problem of the population pressure in a particular country.

Resource-based Theories of Population

The question of population and resources occupied the minds of many thinkers of the past. However, it was Thomas Robert Malthus who for the first time gave a systematic analysis of population and resources, followed by Ricardo and Marx. There are mainly two groups of theories on population and resources—Classical and Optimum theories. These two theories will be discussed in the next section.

Classical Theories of Population

In this section we will discuss the theories of Malthus, Ricardo and Marx.

Malthusian Theory of Population

The pre-Malthusian theory of population was not systematic. Malthus was the first economist to propound a systematic theory of population. Thomas Robert Malthus enunciated his

views regarding population in his famous book, *Essay on the Principle of Population as it Affects the Future Improvement of the Society*. This book was the outcome of the discussion between him and his father who agreed with the utopian vision of his friend, named Godwin. Godwin believed that humanity was on its way to form a society in which disease, melancholy and war could be abolished. Godwin pointed out that a perfect state could be attained if human restraints could be removed. Malthus revolted against the optimism shared by his father and Godwin.

Malthus pointed out that population increased at a much more rapid rate than did the production of food, and, as such, it was useless to think of human prosperity. The gap between population growth and the increase in food supply barred the realisation of the vision of prosperity of men. He said that the pressure of increasing population on food supply will destroy perfection, and there would be human misery. Malthus was severely criticised as a pessimist. He collected the empirical data to support his thesis. Malthus got the second edition of his book published in 1803 when he modified some of his views expressed earlier. But essentially his original thesis stands.

The following assumptions were made by Malthus:

(1) The sexual desire of human beings remains stable. Therefore, the desire to reproduce also remains stable. The development of science and the progress of civilization cannot change this desire.

(2) There is a direct positive correlation between population growth and the standard of living. As the standard of living goes up, the desire to reproduce also increases. Conversely, as the standard of living goes down, the birth rate also goes down.

(3) The Law of Diminishing Returns operates in agriculture.

Salient Features of Malthusian Theory

(i) There is a natural sex instinct in human beings which can increase at a very fast rate. Population increases in

geometrical progression (1,2,4,8,16,32,...) and, if unchecked, doubles itself every 25 years.

(ii) But food supply increases in a slow arithmetical progression (1,2,3,4,5,6,...), due to the operation of the law of diminishing returns based on the supposition that the supply of land is inelastic.

(iii) Population is necessarily limited by the means of subsistence. Human population increases when the means of subsistence increase, unless prevented by some powerful and obvious checks. Malthus also says that in course of time, the growth of population will outstrip the increase in food output. When food supply runs short, people will starve and there will be misery. Thus, the imbalance can be corrected by checking the growth of population.

(iv) Since population increases in geometrical progression, and the food supply in arithmetical progression, population will outrun food supply. As a result of this imbalance, there would be over-population. In the race between population and food supply, the latter would be left much behind. 'The power of population is indefinitely greater than the power in the earth to reproduce subsistence for men'. The imbalance between the increase in food supply and population growth is shown by the following diagram:
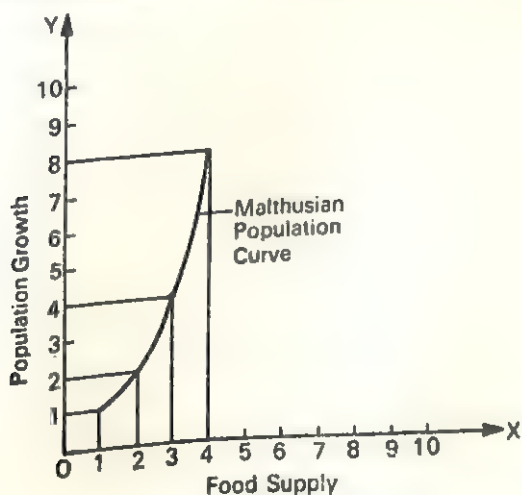
In the preceding diagram, population growth in geometrical progression is measured on the vertical axis and food supply in arithmetical progression is measured on the horizontal axis. When the food supply is 4, the population growth is 8.   Thus, this sort of imbalance raises the population curve upward.

(v) Malthus suggested two types of checks—preventive checks and positive checks.   The preventive checks are applied by men to control the birth rate through late marriage, celibacy, moral restraint and foresight. If people fail to check the growth of population by preventive checks, positive checks operate in the form of misery, vice, famine, war, disease, pestilence, floods and other natural calamities which tend to reduce population, and thereby bring about a balance between population growth and the growth of food supply. According to Malthus, positive checks are crude, and in a civilised society, preventive checks are always in operation. 'In proportion as mankind rises above the conditions of the beasts, population is restrained by the fear

Malthusian Theory of Population

| Population increases in geometric progression, 1,2,4,8,16. .. 256 in 200 years | Food increases in arithmetic progression, 1,2,3,4,5,6.... 5 in 200 years |

Imbalance leads to over-population

Corrected by

| Preventive checks — late marriage, chastity, moral restraints etc. | Positive checks — vice, misery, war, famine, floods etc. |
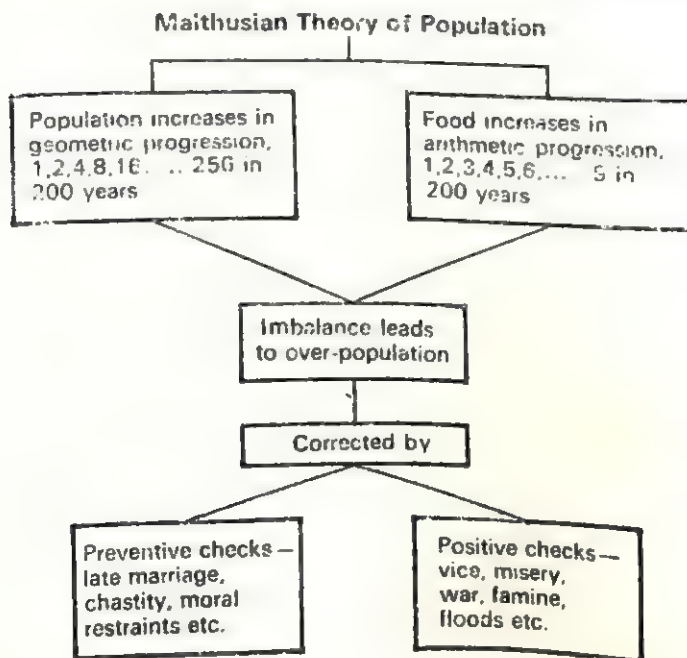
of want, rather than by want itself.' Malthus appealed to his countrymen to adopt preventive checks in order to avoid vice or misery resulting from positive checks. The Malthusian theory of population can now be summarised (See p. 182).

Ricardian Theory of Population

Ricardo's theory of population is a special case of the famous Malthusian theory. In the classical theory, the supply of all commodities is regulated by competition among the capitalists in such a way as to equate the price to value. In the case of supply of labour, precisely the same function is performed by the theory of population. Ricardo's analytical approach was based on market-mechanism. The mechanism necessary to keep wages in subsistence is furnished by his theory of population.

According to Ricardo, labour has its natural price (subsistence) and market price. The market price is regulated by demand and supply of labour. These two prices may deviate from each other according to market forces. When the market price is greater than the natural price of labour, the condition of the labourer improves for he has it in his power to command a greater proportion of the necessaries and pleasures of life. When high wages encourage-increase in population, the number of labourers in the market rises. The leads to a fall in wages, and once again the wage level comes down to subsistence, or even below it. Wage is regulated by the Wage Fund in the classical system. The demand for labour and wages increases with the increase in capital accumulation, and the size of wage fund, which also expands. If both capital and population, increase in the same proportion, wages will remain the same. This is the implication of the wage fund theory expounded by Ricardo. When capital accumulation is stationary, wages also become stationary.

Ricardo brought into the analysis of population, the assumption of the law of diminishing returns to agriculture. Thus, the Malthusian theory of population was linked with the Ricardian theory of rent. Ricardo showed that an increase in the price of wage goods led to an increase in the cost of living (subsistence). Therefore, the money wage had also to be increased. When both

money wage and rent increased, profit went on falling and capital accumulation also went on decreasing. Ultimately, a stage is bound to come where the profit will be zero, capital accumulation will completely cease and the wage level will be at the subsistence level. This state is known as the state of stationary equilibrium. In this stationary state, there will be no progress, and the economic conditions of all concerned will be deteriorating. The workers will be in a state of poverty and misery. The poverty of the workers can be removed in the long run by reducing their numbers. When there is shortage of labour supply relative to demand, the wage level will go up, and for some time the wage earners can remain happy and economically satisfied, so long as they do not increase their numbers again. Ricardo accepted the Malthusian principle of population, and analysed the population-resource problem in the context of a market-system of demand and supply of labour which ultimately affects the wage level and the economic condition of the labourers.

Karl Marx's Theory of Population

Marx is regarded as the Father of Communism. He did not propound separately any theory of population. But his surplus population theory has been deduced from his theory of communism. Marx vehemently criticised the Malthusian theory of population. In his *Das Kapital*, Marx wrote thus:

'His work in first form, was nothing more than schoolboyish, superficial and parsonic, declamatory plagiarism from Defoe, Sir James Stuart, Towsend, Franklin, Wallace, and others; and did not contain a single sentence throughout by Malthus himself.'

According to Marx, increase in population in a country is not due to increase in fertility rate, but it is due to the capitalistic economic system. A capitalist gives to labour as wage a small share of labour's productivity, and the capitalist himself takes the lion's share. The capitalist introduces more and more machinery and thus increases the surplus value of labour's productivity, which is pocketed by the capitalist. The surplus value is the difference between labour's productivity and the wage level. A worker is paid less than the value of his

productivity. When machinery is introduced, unemployment increases and, consequently, a reserve army of labour is created. Under these situations, the wage level goes down further, the poor parents cannot properly rear their children and a large part of the population becomes virtually surplus.

Increase in population, according to Marx, is not due to the ignorance of the poor people, but due to the evil impact of the capitalist economic system. Marx points out that landlordism, unfavourable and high man-land ratio, uncertainty regarding land tenure system and the like are responsible for low food production in a country. When the production of food is not adequate, population growth becomes a problem.

However, the workers work very hard to increase the capital accumulation by the capitalists, and ultimately the workers themselves become surplus. 'It is the working population which, while effecting the accumulation of capital, also provides the means whereby it is itself rendered relatively superfluous, is turned into a relative surplus population; and it does so to an ever-increasing extent. This is a law of population peculiar to the capitalistic method of production.

According to Marx, poverty and misery are not natural consequences; they are the products of the capitalistic pattern of production. Poverty is the outcome of unemployment and under-employment created by the capitalistic system which cannot provide jobs at the same rate at which the population is growing. Marx held that man's tendency to press on the means of subsistence is due solely to the evils of capitalism, which can be abolished by socialistic reforms. Poverty can be abolished by increasing the productivity of labour through technological change. Marx believed that the appropriate method to deal with population-resource relationship is essentially holistic. The system should be internally dynamic to produce new operational methods, concepts and categories to properly deal with population-resource imbalance. In this way, Marx visualised the possibility of social transformation that could eliminate poverty and misery. Poverty and misery are not natural inevitabilities in the Marxian system. Thus, Marx looked at the population-resource problem from a very new angle of perception.

Marx points out that for every historical state of production,

there is a separate law of population. And since there are different stages of production, there are correspondingly different laws of population. In capitalism, the theory of relative surplus population becomes applicable.

Optimum Theory of Population

The theory of optimum population is one of the recent theories of population growth. Prof. Sidgwick in his *Principles of Political Economy*, laid the first foundation of the optimum theory. He did not make use of the word, 'optimum', but expressed the idea of optimum theory. Prof. Edwin Cannan first used the term 'optimum', and he dealt with the optimum population problem in a more systematic manner. In recent years, Robbins, Dalton, Carr-Saunders have done much to popularise the theory of optimum population. The optimum population approach is concerned with the relation between the size of population and the production of wealth.

The concept of optimum population has been defined differently by differnent writers. Prof. Dalton defines it as the population which gives the maximum income per head. According to Robbins, the population which just makes the maximum returns possible is the optimum or best population. Carr-Saunders defines it as 'that population which produces maximum economic welfare.' Cannan defined the optimum population thus: 'At any given time (in a country) there is what may be called a point of maximum return when the amount of labour is such that both an increase and decrease in it would diminish proportionate returns. If the population is not large enough to bring all industry upto this point, returns will be less than they might be and the remedy is increase of population; if, on the other hand, population is so great that the point has been passed, returns are again less than they might be and the remedy is decrease in population.' According to Boulding, the population at which the standard of life is maximum is called the optimum population.

Overpopulation and Underpopulation

The optimum population is that ideal size of population which provides the maximum income per head. Any increase

or decrease in the size of the population above or below the optimum level will decrease the per capita income. Given the stock of natural resources, production technique and the stock of capital, there is a definite size of population corresponding to the highest per capita income. Other things remaining the same, any deviation from this optimumsized population will lead to a reduction in income per head. If the increase in population is followed by an increase in per capita income, the country is *underpopulated*. And it can afford to increase its population till it reaches the optimum level. But if the increase in population leads to a decrease in per capita income, the country is *overpopulated*, and it requires a decline in population till per capita income is maximised.

Clarke distinguishes between the absolute and relative overpopulations. Absolute overpopulation is marked by low living standards even after the attainment of absolute limit of resource development. Relative overpopulation is marked by a situation where the present level of production is inadequate for the population, and greater production is still possible. Relative overpopulation is more common than absolute overpopulation. Relative overpopulation may be the product of limitations of technology. Even in developed countries, there are pockets of overpopulated areas, as in Japan, Australia, Italy, New Zealand. In backward countries, rural overpopulation is more common than industrial overpopulation. Clarke considers industrial overpopulation less obvious because industrial labour is much more flexible than agricultural labour. Relative underpopulation, like relative overpopulation, is more common than absolute underpopulation. Absolute underpopulation will occur only in isolated areas where the degree of replacement of population is less than unity. But relative overpopulation occurs due to insufficient development of resources. Underpopulation may be found primarily in developed countries. However, some less developed countries also contain some areas of underpopulation.

According to Cannan, at any given time increase of labour upto a certain point is attended by increase in proportionate return and beyond that point further increase of labour is attended by diminishing proportionate returns. The per capita

income is the highest at the point where the average product of labour starts falling. This point of maximum return is the point of optimum population. This is explained in the following diagram:
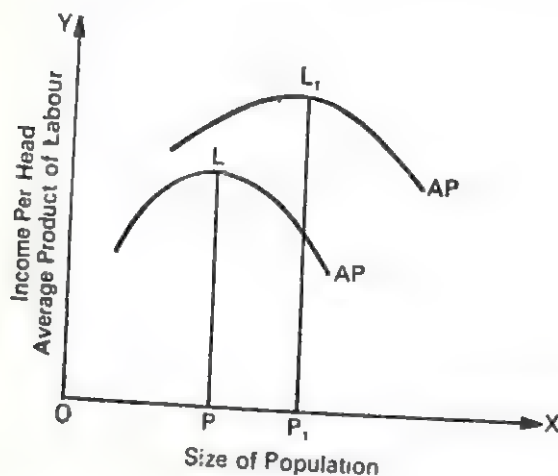
Size of Population

In this diagram, the size of the population is measured on the horizontal axis, and the average product of labour on the vertical axis. AP is the average product of labour, or income per head curve. Upto OP, increases in population lead to rise in average product of labour and per capita income. Beyond OP, average product of labour and per capita income fall. Therefore, when OP is the population, the per capita income is, the highest. Hence, OP is the optimum level of population. If the population is to the left of OP the country is under-populated. But if the population is to the right of OP (OP₁), the country is overpopulated.

But the optimum level of population is not a fixed point. It changes with the change in natural resources, the factors of production, techniques of production etc., e.g. if there are improvements in the methods and techniques of production, the output per head will rise, and the optimum point will shift upward. This can be illustrated by the following figure:
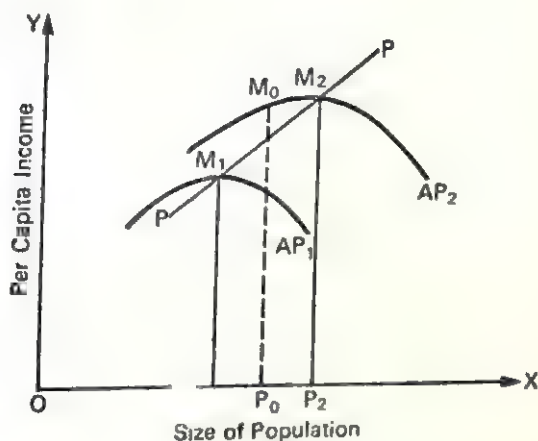
Size of Population

In this figure, AP_1 is the per capita income curve. If an innovation in the technique of production takes place, the per capita income curve will be AP_2. As a consequence, the optimum level of population rises from OP_1 to OP_2 with the increase in per capita income from $M_1 P_1$ to $M_2 P_2$. However, the average product curve may go downward also, resulting in a lower optimum level of population. If the point life $M_1 M_2$ etc. are connected by a line we have a PP curve which repre- sents the path of the movement of optimum population as a result of changes in the economic factors. However, if the optimum population level is OP_o, then OP_1 will mean *under- population* and OP_2 will mean *overpopulation*. If OP_2 is the optimum level of population, the country is *underpopulated* at any point left of OP_2.

Therefore, the optimum point is not a static point. In a dynamic world, all factors are constantly changing and, depend- ing on the magnitudes of the changes of the crucial factors, the optimum level of population also changes. What is the optimum point of population for a country today may not remain so tomorrow, if natural resources, industrial organisa- tion, factors of production, method of production, etc. change. The optimum point is an oscillating point. Prof. Dalton has given a formula for calculating the *overpopulation* and *under- population*. The formula is given as follows.

$$M= \frac{a-o}{o}$$

Where M=Maladjustment,
   a=Actual population,
   o=Optimum population.

The maladjustment is the deviation from the optimum. Maladjustment is a function of two variables—the optimum level of population (o) and the actual level of population (a). When M is positive the country is *overpopulated* but if it is negative the country is *underpopulated*. When N is zero, the country will be neither suffering from *underpopulation*, nor *overpopulation*, and the actual population would be equivalent to optimum population.

According to Carr-Saunders, man has always tried to attain the optimum number. The optimum number is the number which gives the highest average return per head, taking into account the degree of skill, the nature of environment, the customs of the people concerned, and the like. Growth in number is more or less controlled by human beings in order to attain the optimum level. The optimum varies from time to time and is not fixed once for all. The variation of the optimum level of population depends on the factors given above. The number of economically desirable population tends to increase alongwith the increase in skill. 'Man's growth in number has been determined by his notions of the economically desirable numbers under his conditions of life.' He has accepted Malthus' view that population increases at a faster rate than the increase in the means of subsistence. He says that without the use of definite means for slowing down the rate of growth of population through abortion, infanticide and so forth, man would never have approached the optimum number.

Carr-Saunders has emphasised the preventive checks for controlling the undesirable growth of population. According to him, 'the optimum population is that which produces maximum economic welfare . . . Maximum economic welfare is not necessarily the same as maximum real income per head, but for all practical purposes, they may be taken as equivalent'. He

has discussed the theory of optimum population in purely economic terms. He says that man's growth is quite within his control and is conditioned by the attitude he has developed under the particular conditions of his life.

However, his theory has taken into account only the important economic factors. He has neglected the social, political and cultural factors.

The concept, because it involves value-judgement. However, according to Prof. Thompson, Carr-Saunders' theory is more scientific than the natural theories of population.

The optimum theory of population says that the problem of population is not one of mere size but of efficient production and equitable distribution. If production increases alongwith an increase in population, the growth of population is not harmful. Increased production and efficient distribution of the products are important to minimise the problem of population. Prof. Cannan has pointed out that a baby comes into the world not only with a mouth and stomach but also with a pair of hands. Population growth increases the supply of manpower which is essential for economic development. Historically, agricultural development in different countries took place at a time when the population was increasing. Thus, if the per capita income goes up along with the increasing population, the country does not become *overpopulated*. Overpopulation becomes conspicuous when the per capita income starts falling.

WORLD RESOURCES—POPULATION PATTERNS

Resources

It is very difficult to correctly measure the actual and potential resource endowment in the world. However, it must be pointed out that the world's resources must be in proportion to the world's population. With the growth of population, more and more resources have to be exploited. It is necessary to study two aspects of the world's resources: (i) the existing resource position of the world *vis-a-vis* the size and growth rate of the world population, and (ii) the relationship between the distribution of resources and the distribution in different parts of the world.

World resources can be broadly classified into three parts:
(a) agricultural resources, (b) mineral resources, and (c) energy
resources.

Human beings depend on agriculture for food, fibre and
raw materials. Seventy per cent of the earth is covered by
water and the remaining 30 per cent is land. 15 per cent of the
land area is suitable for human living and cultivation. Three-
fourths of the arable land is to be found in those 15 countries
where less than one-third of the world population lives. Half
the area of the total land is in Siberia, Canada and Russia
where the temperature is abnormally low (below 0°C); and in
Asia, South America and Africa where the temperature is
abnormally high and water is scarce. The distribution of cultiv-
able land in the world is shown below:

Distribution of Cultivable Land in the World

States	Cropped Area (Lakh acres)	p.c. of total Land cultivated	per capita cropped area (acres)	Percentage of world farm land
USA	4,350	22.8	3.13	17.6
USSR	4,140	37.9	2.43	16.8
India	3,826	37.9	0.98	15.5
China	1,777	13.8	0.29	8.2
Argentina	644	9.3	4.56	2.6
Canada	634	2.9	5.29	2.5
Germany	499	42.9	0.72	2.0
France	493	36.3	1.22	1.9
Poland	472	49.2	1.47	1.9
Spain	446	35.6	1.65	1.8
Iran	408	10.2	2.47	1.6
Manchuria, Jehol	384	11.9	0.89	1.5
Italy	356	49.9	0.77	1.4
Australia	349	1.7	4.71	1.4
World	18,778	—	—	75.8

Source: UN Publications, 1970.

The world's population has been increasing at a rapid rate. In 1650, the world's population was 54.5 crores; in 1970, 362.6 crores and in 1980, the world population was nearly 450 crores. As a result of the rising population in the last few years, the per capita food intake, on an average, has declined in the world. For feeding the increasing population, the supply of food, meat and milk has to be increased by 25 per cent, 50 per cent and 100 per cent respectively. This is a stupendous task. The world food production at present has increased by 15 per cent; but the rate of growth of population has far outstripped the rate of food supply. Food supply has rapidly increased in Russia, Western Europe and North America. But in America, Asia and Africa, per capita food production today has remained almost the same as what it was some two decades back. Apart from Mexico and Japan, some South Asian countries including India have great potentialities for rapidly increasing agricultural production as an offshoot of the agricultural revolution, or what may be called the 'green revolution'. However, the green revolution has not been able to transform the world into a heaven. In fact, every moment, the world's population is increasing. In order to save the developing countries from starvation, food production will have to be increased at least by 30 per cent.

Modern civilisation is to a large extent dependent on mineral resources. Mineral resources play an important role in our times. A country having sufficient mineral resources can easily be developed industrially, commercially and economically. The development of agriculture, industries, transport and communication and so on, is based mainly on mineral endowments. The world has a limited endowment of mineral resources. Along with industrialisation, the use of minerals has intensified. For instance, in the USA, the use of mineral resources has increased four times the rate of growth of the population. As a result of this increase in consumption, some minerals have shown shortage in supply which has to be made good through import from other countries. Once again, the developing countries appear to be promising. These countries have sufficient mineral resources lying still untapped. A significant portion of the world's mineral requirements can be supplied by

the developing countries, provided the minerals are explored and exploited fully.

The main energy resources are coal, oil, gas, tidal power, hydro-electric power, geo-thermal power, atomic energy, solar energy and the like. Due to a very rapid increase in the demand for oil for development of transport and communication, etc, there was an oil crisis in recent years. If the consumption rate of oil remains unchanged, half the available and known oil resources of the world would be exhausted by the year 2000. All resources are constraints. Since the resources are limited and the population is increasing, a balance has to be maintained between population and resources by both increasing resource utilisation and decreasing population growth. The solar, wind and tidal power sources are being exploited in a very limited way.

Today, the world is passing through a serious oil crisis. The crisis has affected industrial production and development all over the world. Due to the increased price of oil, the cost of development is increasing and, the balance of payment of most of the countries has become unfavourable. The prices of fertilisers and other petroleum products have gone up in the wake of the oil crisis.

It has become necessary now to reduce the consumption of oil and to increase the capacity for fuel production. Coal production should be increased if-possible. The search for oil at the same time should be intensified. The use of tidal, solar and hydro-electric power should be intensified. Tidal power can be generated from different parts of the coast line, e.g., Calcutta, Kutch, Gujarat etc., in India. The places where the temperature inside the earth is very high, geo-thermal energy can be tapped easily. The hotsprings can be helpful for the generation of geo-thermal energy.

Atomic energy has a great potentiality. Countries having large deposits of thorium, as India has, can develop atomic energy. Proper arrangements should be made to make use of solar energy. Solar energy is better than thermal energy.

The consumption of oil in the domestic and transport sectors has to be reduced, and there should be a proper policy in this direction. The engines can be especially modified for

reducing oil consumption. The roads may also be modernised. Every country of the world should have a positive energy policy and should try to produce maximum power and energy inside the country. More research and effort should be made in this direction in order to attain self-sufficiency in the production of oil and energy.

Resource-Population Ratio

The famous sociologist, Samuel Ardway, on the basis of the following two hypotheses, has given a theory which seeks to determine the limit to population growth:

(a) The standard of living of human beings is increasing at a rate equal to the maximum rate of utilisation of the natural resources of the world.

(b) We are utilising more resources every year than we are creating, even after the attainment of sufficient technical progress.

If the above trends continue for a long period, a time will come when the original resources would be so scarce that their increased price will make the additional production totally uneconomical. Obviously, industrial expansion will stop, and we will reach the ultimate limit to growth—where all expansion will cease. The economy will be stagnant and stationary.

Ekarman has divided the world into five different types of situations on the basis of their technical progress and resource-population rations. They are:

(1) *USA Type Situation.* This type of situation prevails in those countries where the population is limited, the resources are unlimited and there is keen competition for the state goods (High Resource-Population Ratio).

(2) *UK Type Situation.* This type of situation is to be found in those countries where the resources are not sufficient. These countries try to obtain resources from other areas, and if they are not able to get the resources, an economic crisis may start (Low Resource-Population Ratio).

(3) *Brazil Type Situation.* This situation is present in those countries which have unlimited resources, limited population

and a predominantly domestic sector (High Resource-Population Ratio and Underdeveloped Technique).

(4) *China Type Situation.* This type of situation can be observed in the countries which are always conscious of the surrounding and impending crises and are having increasing pressure in relation to foreign resources (Low Resource-Population Ratio and Underdeveloped Technique).

(5) *North Pole or Solitary Type Situation.* The countries in this situation possess very limited population and competition in the world for their resources is very keen. These countries are sure to develop by the help of the states of Types 1,2 and 4, as mentioned above (High Resources-Population Ratio).

Population Policy

Population-resource imbalance requires a population policy. The alarming rate at which the population is growing in many less-developed countries calls forth the need for a positive population control planning and policy. Unless this stupendous rate of growth of population is controlled, the fruits of development cannot be enjoyed. When the demographic pressure is very high, there must be a population policy to minimise the rate of growth of population so that the country can increase effective economic investment by reducing demographic investment.

A population policy is a deliberate attempt to spell out the basic objectives and the means to achieve an optimum rate of growth of population by controlling the size and composition of the human resources so as to contribute positively to economic development.

A population policy for a country like India must include the following objectives:

(1) Controlling the birth rate,
(2) Stabilising the present level of population growth,
(3) Providing legal and fiscal motivations to restrict numbers,
(4) Integration of population planning with economic planning,

(5) Increase in per capita income beyond the critical minimum level, and

(6) Increasing the rate of investment.

A population policy must satisfy the following few essential conditions:

(a) It must be implemented in a democratic way without any coercion and force.

(b) It should be based on positive approach, rewards and incentives.

(c) The policy should be dynamic and it should aim at achieving the transition without socio-economic damage to the nation.

The minimum aim of an integrated population policy in an underdeveloped country like India is to spread the idea of birth control as a measure to control fertility. It should not be forgotten that a period of mass education will be necessary before a policy of spreading birth control can have its influence on fertility. A deliberate choice of population control policy in the programme of industrialisation in countries like India and Japan is unique in modern world history.

Prof. Myrdal asserts that in controlling fertility, the south Asian countries have to face a rigid value premise. The value premise that the death rate has to be kept lower is accepted on all hands. The population policy has to be directed mainly towards two ends: (i) decreasing the rate of growth of population, and (ii) increasing the quality of population. It should encourage voluntary birth control. For improving the quality, better housing, education, health care, better living conditions and redistribution of cash incomes in favour of mothers and children may be encouraged. These benefits will be granted more to the poor parents, and will be very helpful once the fertility rate is brought down. Fertility can be checked by birth control through family planning measures.

Empirical studies have confirmed that there is a readiness on the part of the people to take a positive attitude towards birth control. Change in environment can very quickly change the

whole attitude towards reproduction; and education for family planning, properly directed, can be very helpful in changing favourably the environment and attitudes. A strong case for the expansion of women's education can be made from the point of view of family planning. Potential fathers are less responsive to the idea of birth control than potential mothers who ultimately have to bear children. In family planning programmes, methods which can be introduced on the initiative of women may be given special importance. For implementing a large scale family planning programme, international investment in social education and other necessary assistance and cooperation may be sought. However, complacency about, or even tolerance of a high rate of mortality because it keeps down the rate of growth of population, is simply not permissive. Some people have suggested economic penalisation of families with a larger number of children, or rewarding those having a smaller number of children. According to Myrdal, this would not be a proper policy. However, birth control efforts would be concentrated more on poor parents having a large number of children.

In underdeveloped countries, various inhibitions such as political, social, religious, and individual callousness and apathy stand in the way of success of population control programmes. The government has to play a vital role to make such a programme a success. The population control policy has to be made an integral part of the general development programme. Failure in the short run should not discourage anyone. By its very nature, the population policy has to be viewed in its long-term perspective.

Population planning is designed to play the most important role during the process of economic development. If economic development is planned, population planning should precede general developmental planning. One should know both the existing and the future rate of growth of population. The rate of economic growth and the speed at which resource utilisation takes place in course of planning should be properly synchronised with the rate of growth of population. India urgently requires a democratic and positive population policy. If the high rate of growth of population is not checked, the rate of economic growth generated by the Five Year Plans would be

seriously hampered. A national population policy for a country like India should consider the following points:

(1) Planning should be undertaken both for the existing and the future population so that the benefits of planning are felt by a large number of people within the shortest possible time.

(2) Apart from better public health-cum-sanitation measures for controlling the death rate, all possible methods for an effective quantitative control of population growth should be applied.

(3) A population Planning Commission consisting of demographers, sociologists, statisticians and economists, is an urgent necessity. The work of the Commission would be to evolve a population control policy and to devise measures for its implementation.

(4) The state should increase its expenditure substantially for setting up as many family planning clinics as possible in rural areas. One family planning clinic for two villages would be ideal.

(5) Spread of adult education in rural areas is also essential.

In a country like India, birth control has to be undertaken first, and a higher standard of living may be expected to follow as a consequence. The population policy in a country like India should incorporate four approaches:

(i) Control of birth rate,
(ii) Substantial economic development,
(iii) Migration and emigration, and
(iv) Family planning.

In order to reduce the birth rate, birth control has to be practised. As a result of increase in per capita income, the birth rate tends to fall. At a higher level of income, the standard of living becomes a more dominant consideration. Many will, at that stage, prefer cars to babies. Urbanisation will also help in reducing the birth rate. In an urban area, a

big family is a liability. Lack of accommodation, income and so on help to reduce the tendency towards a higher birth rate. The birth rate is also reduced by late marriage. But all these factors are not very helpful to lead to a downward trend in the birth rate.

The birth rate may come down if the death rate is reduced because, in that case, for the survival of the human race, a higher birth rate is not required. But this takes too long a time. The birth rate in the short-run may be deliberately reduced by certain methods, contraceptives, etc. These methods are adopted for limiting the size of the family. According to Robert Casen, the investment in birth control is likely to bring about an increase of (+) Rs. 30 in per capita income, which is 15 times more than the benefit that can accrue from any alternative investment. Prof. Enke observes that the benefits from such an investment would be 100 times larger. Thus, on economic grounds, investment in family planning is sufficiently justified.

According to Prof. Leibenstein, if income level is beyond a certain minimum level and investment is beyond a certain critical minimum level, population growth will come down. Increased industrialisation is helpful, as experience shows, to decrease the rate of growth of population. However, there is a maximum biological rate (3 per cent to 4 per cent nearly) beyond which the rate of growth of population cannot go. Industrialisation leads to more and more urbanisation. Urbanisation makes people more and more standard and status conscious, raises the cost of rearing children and the educational cost, increases the period of education gives more freedom to men and women and more alternative areas for entertainment. Urbanisation can go a long way in reducing the population problem by changing the whole attitude towards life and family.

Internal migration of population from thickly populated to scarcely populated areas can solve the problem to some extent. Emigration may be encouraged in a thickly populated country like India. Indians may be encouraged to settle in other countries, provided it does not involve 'brain drain'. A country like India should have a selective manpower export policy on

a regular basis to earn foreign exchange and to reduce population pressure. But emigration does not depend merely on the push factor of the sending country. It also depends on the pull factors of receiving countries as well.

A GEOGRAPHICAL OVERVIEW OF
WORLD POPULATION

The world population is currently about 4.7 billion and growing as close to 1.7 per cent per annum—twice as fast as in the first half of this century, but slower than the peak rates of 2 per cent in the early 1960s. China ranks first in world population (9,570 lakhs) India, second (6,840 lakhs) the USSR third (2,670 lakhs) and the USA fourth (2,220 lakhs). It is estimated that by 2,000 A.D., the world population is likely to be 8 billion, and India may overtake China in total population.

World Population Growth: Trend

On the basis of past projections, Willcox and Carr-Saunders estimated the population of the world between 1650 and 1900. Their estimates are given on page 203:

It appears from the above estimates that world population was growing at a rate of 0.3 per cent per year between 1650-1750, and 0.45 per cent per year between 1750 and 1800. The world population has a clear, increasing trend. Every year, 12 crores 70 lakh children are born, 9 crores 50 lakh children attain the school-going age and 1 crore 90 lakh people attain the age of 65. These figures have gone up in recent years. The rate of growth of world population can be known from the following chart (per cent per year):

Year	1750-1800	1800-1850	1850-1900	1900-1950	1950-1965	1972
Rate of growth	0.4	0.5	0.5	0.8	1.8	2.0

World Population, 1650-1900

(in millions)

Willcox's Estimate (Year)	World Total	Africa	North America	Latin America	Asia Excluding USSR	Europe and Asiatic Europe	Oceania	Area of European Settlement
1650	470	100	1	7	257	103	2	113
1750	694	100	1	10	437	144	2	157
1800	919	100	6	23	595	193	2	224
1850	1,091	100	26	33	656	274	2	335
1900	1,571	141	81	63	857	423	6	573

Carr-Saunders Estimate (Year)	World Total	Africa	North America	Latin America	Asia (Excluding USSR)	Europe and Asiatic Europe	Oceania	Area of European Settlement
1650	545	100	1	12	327	103	2	118
1750	728	95	1	11	475	144	2	158
1800	906	90	6	19	597	192	2	219
1850	1,171	95	26	33	741	274	2	335
1900	1,608	120	81	63	915	423	6	573

The world population has increased from 50 crores in 1650 to 400 crores in 1975—an increase of eight times. The trend in world population can be clearly seen from the following table:

Year	Population
1650	50
1750	80
1800	98
1850	126
1900	165
1950	251
1965	328
1970	360
1972	378
1975	400
1986	500
1995	600

The world's population doubled over a century to 200 crores between 1830 and 1930. Between 1960 and 1975, the world population went up from 300 crores to 400 crores and, according to a recent projection, it would be 600 crores in 1995. The world's population reached 3,890 million in mid-1974, an increase of 72 million in one year, according to the UN Demographic Year book. The figure represented a 1.9 per cent annual growth which, if maintained, will double the world population in 36 years by the year 2010.

The rate of growth of population is 2.6 per cent per year in Africa, 2.3 per cent in Asia, 2.1 per cent in South America, 1.0 per cent in Europe and North America, 3.7 per cent in Libya and El Salvador and 0 per cent in East Germany.

World population has increased mainly due to natural factors, and there has been a compound rate of growth of its population. Every day 2 lakh children are born which means that every year nearly 7 crores 20 lakh people are born. The world population has increased at the highest rate in the present century. In advanced countries, the birth rate started declining

from 1900. In England and Wales, the birth rate has declined considerably. But in underdeveloped countries, it has remained almost constant or has declined very insignificantly. The death rate in world population is gradually declining. This is due to improvement in medical and health facilities and also in the diet and nutrition. The reduction in the death rate is one of the causes of increasing population. The death rate also influences the age structure, sex ratio, etc. Eleven nations in the world have an infant mortality rate of less than 15 per 1000 live births, while six nations record a rate of over 60 deaths per 1000 live births.

If the present rate of growth of population continues, the inequality in the standard of living between the rich and the poor countries will more conspicuously increase and there would be international conflict, cold war and tension among the advanced and underdeveloped countries. Differential growth of populations of nations is the basic factor in international relations because it brings about changing needs for resources and alterations in the military status of nations. On the other hand, an increasing population will necessitate an increasing amount of demographic investment which will reduce the rate of economic development and will accentuate poverty. The birth rate and death rate of the world population for a few countries are shown in the following table:

Birth Rate and Death Rate

(Average annual rate per 1000 population)

Country	Population millions 1970	Birth rate	Death rate
1	2	3	4
Europe	462	18.0	10.2
Japan	104	18.0	7.0
USSR	243	17.9	7.7
North America	228	19.3	9.4
East Asia	779	33.1	15.1

1	2	3	4
Temperate S. America	39	26.3	9.1
Oceana	15	20.2	8.7
Caribbean	26	35.0	10.9
Africa	345	46.8	21.3
Polynesia & Melanesia	4	41.2	14.9
South Asia	1,126	44.3	16.8
Eastern Asia	47	35.0	10.7
Tropical South America	151	39.8	10.0
Central America	67	43.7	10.1
World	3,635	33.8	14.0

We now give the birth rates, death rates, natural increases and net reproduction rates of different regions in the world, as estimated by the United Nations in 1982. The net reproduction rate is defined as the average number of daughters to whom a group of newly born girls will give birth, given age specific fertility and mortality rates. The United Nations has defined the more developed countries as the Soviet Union, Japan, Australia, New Zealand and all those in North America and Europe.

The United Nations has given the different rates of growth of population for different countries, including the more developed and less developed ones for the period 1950—2025. The estimates, therefore, are partly based on projections. Thé population growth rates of different world countries are shown on p. 207-208.

Trends and changes in the socio-economic structure and cultural values of each society, political trends and the effectiveness of family planning programmes are all important determinants of fertility, and orderly progress is assumed for changes over time. For the less developed regions, fertility delclines quickly from a high level with social and economic development. Where fertility is very high, family planning policies are expected to accelerate the decline. In the more developed regions where

DETERMINANTS OF POPULATION GROWTH
Birth Rates, Death Rates, Natural Increases and Net Reproduction Rates by Region
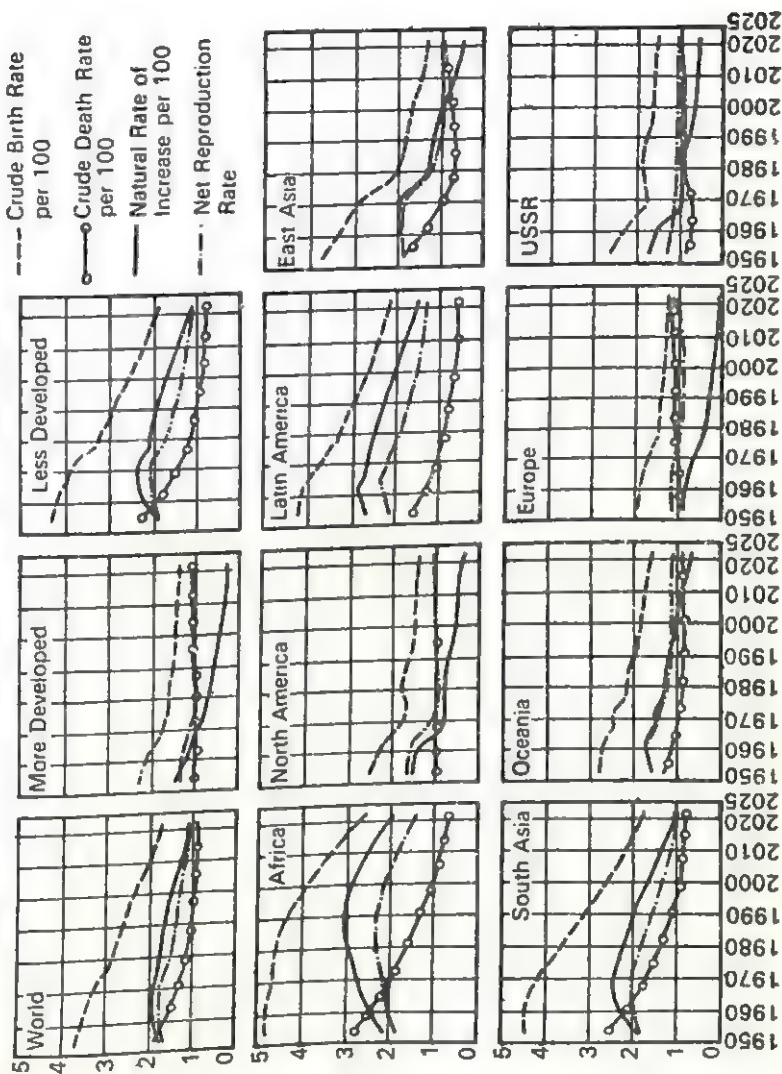
WORLD POPULATION 1950-2025
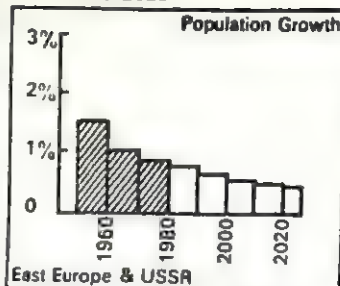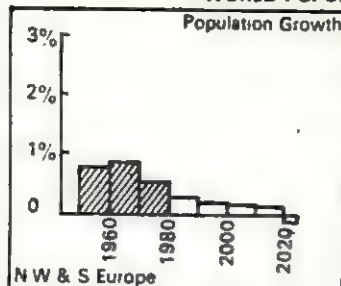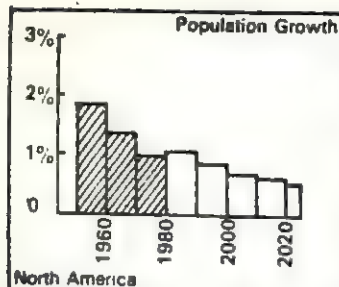
Legend:
- UN Historic Population Growth Estimates
- UN Medium Variant Forecast Population Growth

Charts (each labeled "Population Growth", y-axis 0–3%, x-axis years 1960, 1980, 2000, 2020):
North America; N W & S Europe; East Europe & USSR; World; More Developed; Less Developed; Oceania; Africa; East Asia; Latin America; South Asia
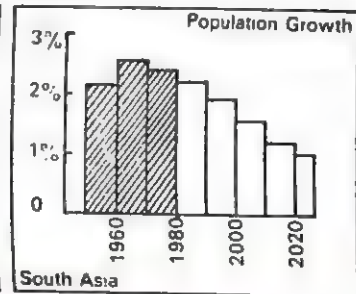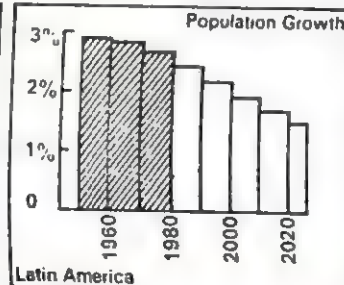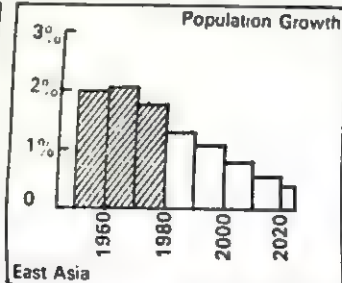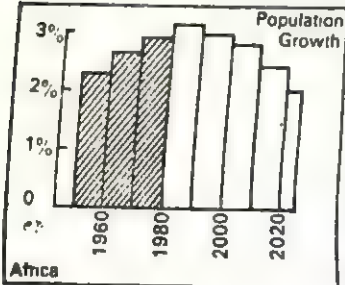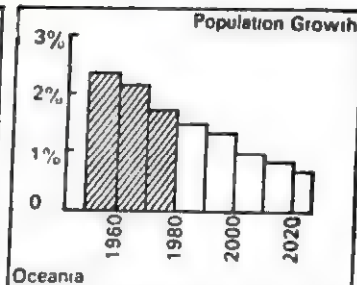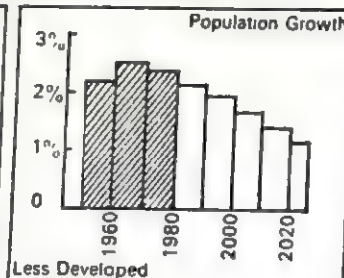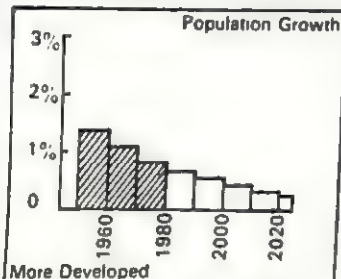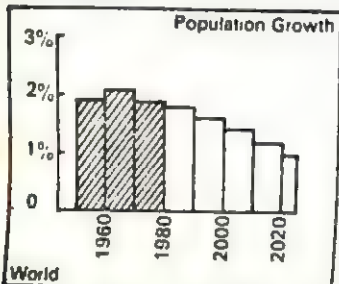
fertility is already low, it continues to decline slowly. The fall in the crude death rate is expected to continue for all regions other than East Asia in the less developed world while, in contrast, the rise in the rate for the more developed world, which started in the late 1960s, is not expected to be reversed because of the ageing population. By 1995, the crude death rate in the more developed world will therefore have risen above that of the less developed.

Africa is the only area where the relative movement in birth and death rates have yet to produce a slowing in the natural rate of increase; and although this should change within the next decade, the population will increase three-fold by 2025. In South Asia, which currently accounts for 40 per cent of the world population growth, though there is a halving in the birth rate, the region will still be responsible for more than a third of the world's total annual increase in 2025. The picture is different in East Asia, where a rapid reduction in the birth rate and a rising death rate reduces the region's contribution to world growth from 19 per cent in 1980 to only 8.4 per cent in 2025.

Overall, changes in fertility and mortality are seen as resulting in a decline in the world's net reproduction rate. In most of the less developed world the rate halves towards one between 1960 and 2025, while in some areas of the more developed world, notably Europe, the rate is already below one. Not only will the European population be the world's oldest, it will also be the only broad world region where the population size is roughly stable in the first quarter of the next century.

Population Projections

The United Nations projects reductions in yearly growth of population below 1 per cent by 2025, but the annual net addition will then be 76 million—compared with 46 million in the early 1950s and 79 million now—and the world population will exceed 8 billion. Population growth will not be even between the regions. Growth rates in the more developed regions are well below the world average and further declines should result in a population increase of only 20 per cent by 2025. In contrast, the population of the less-developed world

is expected to double before 2025, increasing its share of the world total from around 75 per cent today to nearly 85 per cent in 2025.

Population projections are inevitably highly sensitive to assumptions about future trends in fertility, mortality and migration. The projections used throughout the inset represent the United Nations' central forecasts. The low and high forecast variants given below indicate the range of forecasts that result from variation in the underlying assumptions. Whereas the UN's central forecast is that the world population will grow by about 85 per cent between 1980 and 2025, the low and high variants range from less than 60 per cent to more than 105 per cent. The estimates given by the UN are shown here in the form of a chart. Fertility, mortality and migration are the engines of population change. Catastrophes such as famines, epidemics and war are not normally embodied in population projections; and, as future migration trends between broad regions may be unstable and difficult to asses, it is generally assumed that migration falls towards zero over time. Most migration takes place between countries within the broad regions.

Upper and Lower Population Projections

Billions	1990	2000	2025
World			
Low Variant	5.14	5.83	7.17
Medium Variant	5.24	6.12	8.19
High Variant	5.33	6.33	9.13
More Developed			
Low Variant	1.19	1.23	1.25
Medium Variant	1.21	1.27	1.37
High Variant	1.22	1.30	1.49
Less Developed			
Low Variant	3.95	4.60	5.92
Medium Variant	4.03	4.85	6.82
High Variant	4.11	5.03	7.64

Migration

A large proportion of the world population has been influenced by international migration. People have migrated from Europe and Asia to Canada, Australia and America. A large part of the increase in America's population is due to immigration.

Countries	population in 1972 (crores)	population in the year 2000 (crores)
Asia	215.4	377.7
Europe	46.9	56.8
USSR	24.8	33.0
Africa	36.4	81.8
USA and Canada	23.1	33.3
South America	30.0	65.2
Oceania	2.0	3.5
Developed countries (UK, USA, USSR, Canada and Japan)	105.4	137.6
Developing countries (Africa, South America, Oceania, Asia excluding Japan)	273.2	513.7
Whole World	378.6	651.3

Distribution of World Population

The distribution of world population for the years 1950, 1980, 2000 and 2025 for more developed and less developed countries are shown in the following figures, as estimated by the United Nations. The countries included are: Eastern Europe and the USSR, North America, North, West and South Europe, East Asia, South Asia, Africa, Latin America and Oceania (See also the Chapter on *Distribution and Density of Population*; Chapter II).

DISTRIBUTION OF WORLD POPULATION

1950
2.52 Billion

More Developed

6.6%
10.6%
0.5%
6.5%
8.7%

12.0%

26.7%

28.4%

Less Developed

1980
4.43 Billion

More Developed

0.5%

5.6%
8.4%

10.6%

26.5%

31.7%

Less Developed

2000
6.12 Billion

More Developed

0.5%

4.8%
6.4%

13.9%

24.1%

23.9%

Less Developed

2025
8.19 Billion

More Developed

0.4%

4.8%

11.6

20.9

8.8

34.4

Less Developed

- East Europe & USSR
- North America
- N W & S Europe
- East Asia
- South Asia
- Africa
- Latin America
- Oceania

	1950	1980	2000	2025	
More Developed	32.9	25.5	20.7	16.8	as defined in 1980
Less Developed	67.1	74.5	79.3	83.2	as a percentage of world total

Age and Sex Ratios

The age structure reflects the significant ageing of the world population over the next 40 years. A fall in the natural rate of increase from the late 1970s, and greater life expectancy change the age structure of the less developed countries from a broadly based young population in 1950 to one more evenly distributed into middle age by 2025. For the more developed countries the distribution has already lost its triangular shape and by 2025 the figure is virtually rectangular for age groups up to 70 years.

Though the overall ratio of males to females in the world changes little over time, the greater life expectancy of women, particularly in the more developed regions, results in differences in sex ratios by ago group, with a lower ratio for the older age ranges. Changes in the age structures of the regional populations alter the proportion of children and elderly people relative to the population that is potentially economically active. As presented here, the age dependency ratios are only suitable for broad demographic rather than economic comparison, as they do not consider regional differences in school leaving age, retirement age or participation rates. In the less-developed world the level of dependency is expected to decline in all regions between 1980 and 2025, except for East Asia where the population ages rapidly. For Africa, South Asia and South America the decline is sharp from high levels even though the absolute size of the young population increases. In the more developed regions, the ratios are smaller and there is much less movement though, in all cases, growth in the dependency of the older age group more than offsets the decline in the younger, caused by its negligible absolute growth, to produce a rise between 2000 and 2025. By 2025, overall dependency is higher for the more developed countries.

The following figures depict the age and sex structures in more developed and less-developed regions of the world, as estimated by the United Nations.

Age Dependency Ratios

The age dependency ratios in broad world regions, as estimated by the United Nations are shown in the following

AGE-SEX STRUCTURE OF MORE DEVELOPED
AND LESS DEVELOPED REGIONS
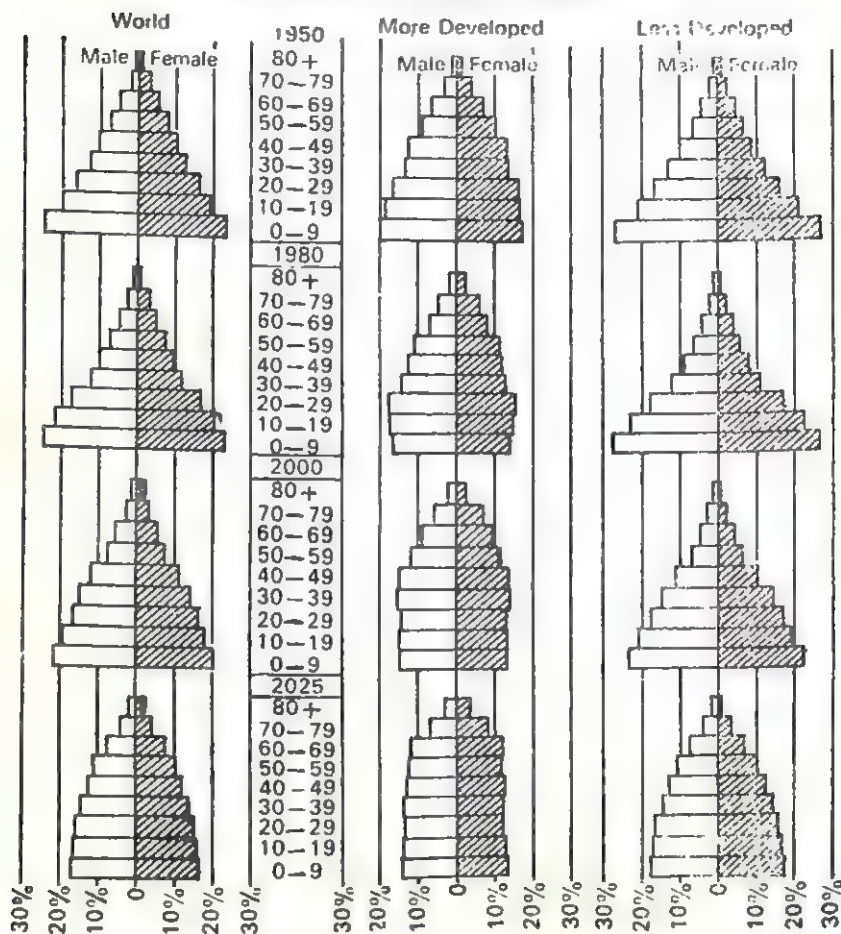
diagrams. The diagrams take into account more developed
countries and less-developed countries, including Africa, North
America, Latin America, East Asia, South Asia, Oceania,
North, West & South Europe, and East Europe and the USSR.

Median Age of Population and Life Expectancy

The median age and average life expectancy at birth between
1950 – 2025 for broad world regions are shown in the following
diagrams, as estimated by the United Nations. The median

AGE DEPENDENCY RATIOS IN WORLD REGIONS

Population under 15 years as a percentage of population aged 15-64 years

Population aged 65 years and older as a percentage of population aged 15-64 years

World

More Developed Countries

Less Developed Countries

Africa

North America

Latin America

East Asia

South Asia

Oceania

North West & South Europe

East Europe & USSR

0   20%   40%   60%   80%   100%

1950 1980 2000 2025
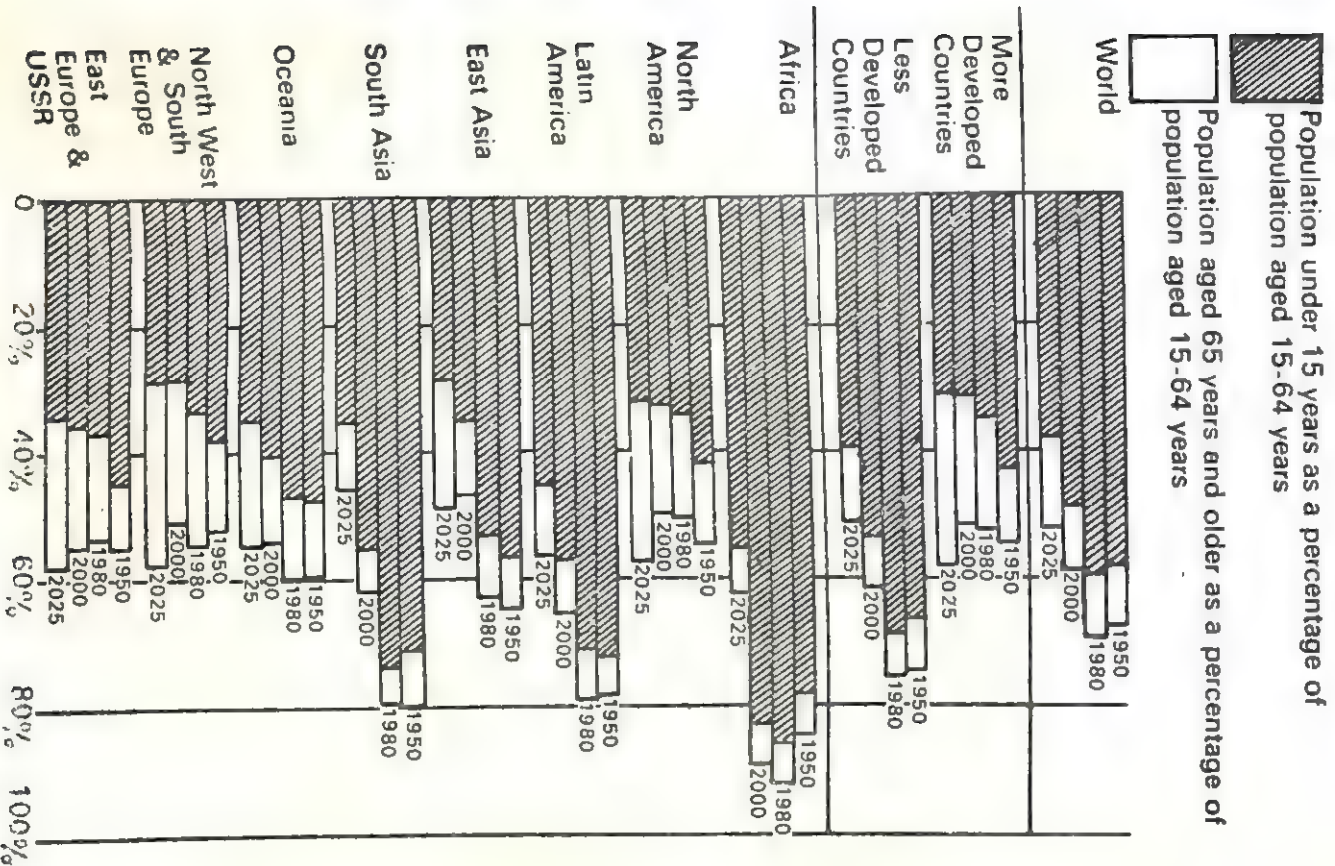
AVERAGE LIFE EXPECTANCY AT BIRTH BY REGION 1950-2025

North America, Oceania, East Asia, World, South Asia, Latin America, USSR, Europe, Africa
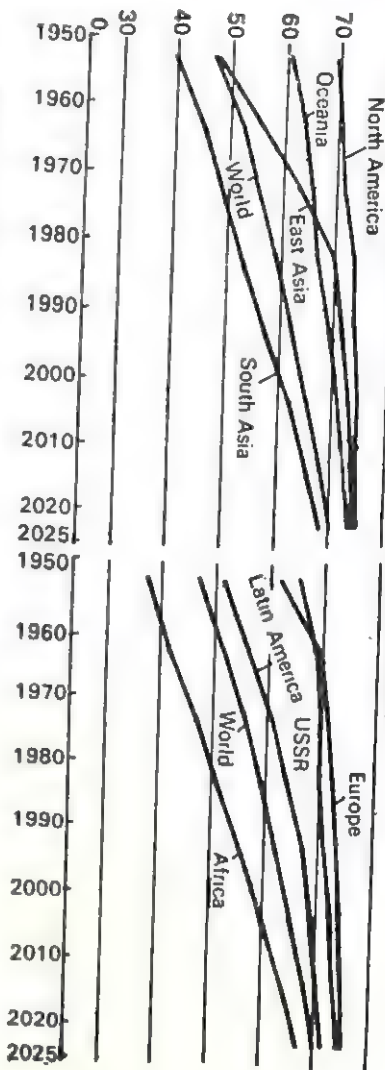
MEDIAN AGE OF POPULATION BY REGION 1950-2025

North America, East Asia, World, Oceania, South Asia, World, USSR, Europe, Latin America, Africa
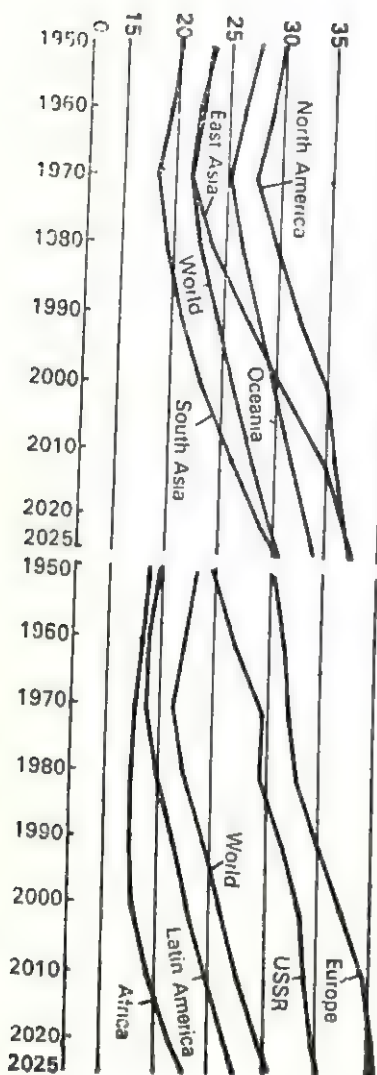
age splits the population equally between those who are older and those who are younger and an increase is expected from 1970 in all broad regions except Africa where it is delayed until the turn of the century. In East Asia, the rapid rise reflects the

success of population control in China. One of the major determinants of the median age is life expectancy at birth. This will rise throughout the world, but dramatic improvements are projected for Africa and South Asia, which narrow the variation between regions considerably over time. Life expectation in Europe and America is nearly 70 years. Life expectation indicates as to how long a man can expect to live. According to one estimate, life expectancy in Sweden continues to be the highest in the world, with 14 countries recording an expectation of life of over 75 years for females and eight nations showing over 70 years for males. Life expectation in a few countries is shown in the following table:

Expectation of Life

Countries	Years	Males	Females
Sweden	1962	71.32	75.39
Netherlands	1954-60	71.40	74.80
USSR	1970	70.40	—
New Zealand	1954-60	68.20	73.00
USA	1963	66.60	73.40
Japan	1963	67.21	72.34
Trinidad	1957	59.88	63.35
Malaya	1956-58	55.78	58.19
India	1981	52.00	56.00

Indicators of Population

We now can discuss various indicators such as economic, political, social and so on, for studying the different aspects of the world population. For this purpose, we have chosen 23 countries from different areas of the world. The data for this analysis have been collected by different organisations such as ADB, World Bank, OECD and the US Department of

Commerce. These data are published by *The Economist* (24 December, 1983—January 1984), in the form of different tables. The economic indicators as given below include per capita income, consumption, cost of living, unemployment, inflation and so on. The 23 countries include rich and poor, hot and cold, and communist and capitalist countries. The data for studying the indictors have partially come from *The Travellers' Dictionary of Quotation*, edited by Peter Yapp and published by Routledge and Kegan Paul.

TABLE 1

Economic Indicators

	Gdp per capita $ 1981	Gdp growth average annual 1977-82†	Inflation average annual rate % 1977-82†	Unemployment % of total labour force 1982†	Cost of living (New York City Dec. 1982 = 100)††	Private consumption per capita $ 1982†	Income tax & social security payments as % gross income‡ 1980-81	Number of cars per 1,000 people 1982	Number of telephones per 1,000 people 1981†
USA	12,820	1.6	9.8	9.5	100	8,479	30.1	550	789
Japan	10,080	4.4	4.6	2.4	135	5,263	22.3	217	502
W. Germany	13,450	1.6	4.7	6.1	101	6,013	24.6	385	488
France	12,190	2.0	11.7	8.0	103	6,847	15.0	370	498
Britain	9,110	0.5	12.0	12.5	103	5,155	29.9	286	507
Itlay	6,960	2.2	16.8	8.9	80	3,847	12.6	345	364

Canada	11,400	1.0	10.3	10.9	82	6,831	31.0	435	694
Australia	11,080	2.4	9.6	7.1	91	6,444	32.2	417	489
Sweden	14,870	1.3	10.3	3.1	125	6,366	52.1	357	828
Spain	5,640	0.9	16.0	15.9	80	3,465	9.9	222	329
Switzerland	17,430	1.5	4.2	0.4	115	9,260	18.0	385	751
Saudi Arabia	12,600	6.4	1.2	0.0*	125*	3,257	0.0	125	25
Israel	5,160	3.6	97.0	5.1	110*	3,554	21.0	125	293
Kenya	420	5.4	14.1	15.0*	79	246	25.0*	8	21
Russia	5,860	2.2	0.0*	0.0*	100*	3,650*	35.0*	36	89
Hungary	2,100	2.5	6.8	1.0*	61	1,306	35.0*	103	118
Mexico	2,250	6.6	29.0	4.2	71	2,053	15.9	65	72
Brazil	2,220	3.9	73.6	6.9	84	1,513	20.0	70	63
Bahamas	3,620	3.5*	8.8	14.3	110	2,942	0.0	200	294
Singapore	5,240	9.6	5.8	6.7	98	2,994	15.1	80	291
India	260	3.4	8.2	18.3	80	175	50.0*	1	4
China	300	5.5**	0.0*	2.1	68	192	35.0*	0.5	8
Sri Lanka	300	6.1	15.4	15.3	76	249	25.0*	9	6

Notes: *sometimes quesstimates, sometimes official lies, † or latest available year, ‡ for a production manager in a large manufacturing company, ††for UN officials, **1970-81.

Source: World Bank, IMF, OECD, ILO Asian Development Bank, UN, Union Bank of Switzerland, national sources.

The social indicators such as education, schooling work per week, urbanisation and so on are shown in the table for "Social indicators." These indicators also take into account 23 countries of the world. These indicators are self-explanatory. Therefore, no further explanation is added for these tables (indicators).

TABLE 2

Social Indicators

	Number enrolled in primary school as %of population‡ 6-11 yrs 1980	Number enrolled in higher education as %of population 20-24 yrs 1979	Average number of hours worked per week. non-agricultural 1982†	Number of people per sq. mile 1982	Proportion of population living in four largest cities % 1981†	Population of growth average annual rate % 1970-82†	Proportion of marriages ending in divorce % 1979†	Suicide & self-inflic-ed injury per 100,000 people 1980†
USA	98	55	34.8	64	12	1.0	50	12
Japan	101	30	40.2	825	16	1.0	18	18
W. Germany	112*	26	40.7	643	9	0.1	9	21
France	112	25	39.8	256	22	0.5	22	17
Britain	104	20	43.0	595	20	0.1	36	9

Italy	102	27	38.8	493	12	0.5	4	6
Canada	100	36	38.2	6	31	1.1	32	15
Australia	110	26	35.0	5	54	1.4	44	11
Sweden	97	37	35.6	48	35	0.3	53	19
Spain	109	22	43.3	195	17	1.0	0††	4
Switzerland	86	17	44.1	398	27	0.1	31	25
Saudi Arabia	64	7	43.0‡‡	11	28	4.5	0††	2*
Israel	96	26	35.4	472	56	2.6	14	6
Kenya	108	1	45.0*	79	9	3.8	1*	2*
Russia	106	21	40.0*	31	6	0.9	33	45*
Hungary	97	13	40.0*	299	25	0.3	32	45
Mexico	120	15	45.0*	94	29	2.9	5	2
Brazil	93	12	45.0*	39	22	2.4	0††	2*
Bahamas	135	3*	48.0	44	99	2.2	7	1
Singapore	107	8	48.8	10549	100	1.5	1*	11
India	76	9	50.0*	570	3	2.2	1*	3*
China	117	1	50.0*	289	3	1.5	0††	3*
Sri Lanka	100	3	53.1	610	9	1.8	1	3*

Notes: *guesstimate, †or latest available year, ‡figures over 100 % denotes earlier age start or later finishing, ††no provision for divorce, ‡‡excluding Ramadan.
Source: World Bank. ILO, WHO, US Dept. of Commerce.

The next table compiled shows the "Cultural indictors" such as adult literacy rate, number of newspapers sold daily per thousand people, number of cinemas per million people, number of foreign visitors as per cent of population, number of points of pure alcohol consumed per person and number of television sets per thousand people. Like the previous table, this table is also self-explanatory.

TABLE 3

Cultural Indicators

	Abult literacy rate % 1980	Number of television sets per 1,000 people 1980*	Number of newspapers sold daily per 1,000 people 1979*	Number of cinemas per million people 1979	Number of Nobel prizes per 10 million of 1982 population 1901-1982	Number of foreign visitors as % of population 1979	Number of pints of pure alcohol consumed per person 1981*
USA	99	624	282	52	6.9	8.8	14.6
Japan	99	539	569	22	0.3	1.0	9.9
W. Germany	99	337†	423	50	9.5	14.6	22.0
France	99	354	205	105	0.7	52.4	24.1
Britain	99	404	453	27	13.9	22.4	12.5
Italy	98	386	97	223	1.9	31.1	19.2
Canada	99	471	241	52	1.3	51.8	16.0

Australia	100	378	336	44	2.7	4.4	17.6
Sweden	99	381†	526	153	32.4	21.5	9.5
Spain	98*	252	128	148	0.3	104.6	22.9
Switzerland	99	314†	395	81	21.6	117.5	19.4
Saudi Arabia	25	251	19	2*	0	65.7	0.0
Israel	90*	150†	227	66	2.5	26.7	12.0*
Kenya	47	4	11	4	0	2.4	5.0*
Russia	100*	303	396	572	0.6	1.7	10.9
Hungary	99	258†	243	337	2.7	93.0	20.4
Mexico	83	104	64	40	0.1	5.2	4.2
Brazil	76	122	44	31	0	0.6	15.0*
Bahamas	93	135	118	45	0	762.1	14.0*
Singapore	83	166†	249	31	0	86.0	10.0*
India	36	2†	20	9	0.03	0.1	5.0*
China	69	5	19	2*	0.02	0.1	5.0*
Sri Lanka	85	2	42	9*	0	1.3	5.0*

Notes: *guesstimate or official claim, †licences, ‡or latest available year.
Source: OECD. US Dept of Commerce, World Bank, UN, Whitaker's Almanack, Brewers Society.

The following two tables are the "Health indicators" of the people of the 23 countries chosen. These tables indicate the life expectancy at birth, infant mortality per thousand live births, number of deaths, number of doctors per lakh people, average daily calorie supply, Homicide and so on.

TABLE 4

Health Indicators

	Life expectancy at birth, years 1981	Infant mortality per 1,000 live births 1981	Number of deaths per 1,000 people 1981	Number of doctors per 100,000 people 1980	Average daily calorie supply as % of minimum†† calorie requirement 1980	Deaths from heart disease per 100,000 people 1980††	Homicide & serious assault per 100,000 people 1980‡
USA	75	72	9	192	139	435	9
Japan	77	7	6	128	124	266	1
W. Germany	73	13	12	222	133	584	1
France	76	10	10	172	134	380	1
Britain	74	12	12	154	132	579	1
Italy	74	14	10	294	150	466	1
Canada	75	10	7	182	127	343	2

Australia	74	10	7	179	117	391	2
Sweden	77	7	11	204	119	603	1
Spain	74	10	8	217	135	361	1
Switzerland	76	9	9	244	133	448	1
Saudi Arabia	55	111	13	61	120	320*	2*
Israel	73	15	7	270	118	320	2*
Kenya	56	85	13	9	88	70*	2*
Russia	72	20	10	357	132	500	3*
Hungary	71	21	14	250	134	718	3
Mexico	66	54	7	79*	121	109	16
Brazil	64	75	8	59	109	110*	16*
Bahamas	66	25	5	66	130*	72	1*
Singapore	72	12	5	87	134	179	2
India	52	121	13	27	87	175*	5*
China	67	71	8	52	107	250*	1*
Sri Lank	69	43	6	14	102	175*	5*

Notes: *gesstimate, †includes other diseases of the circulatory system, ‡or latest available year, ††FAO recommended.
Source: World Bank. WHO, UN

DOCTORS SAVE BABIES
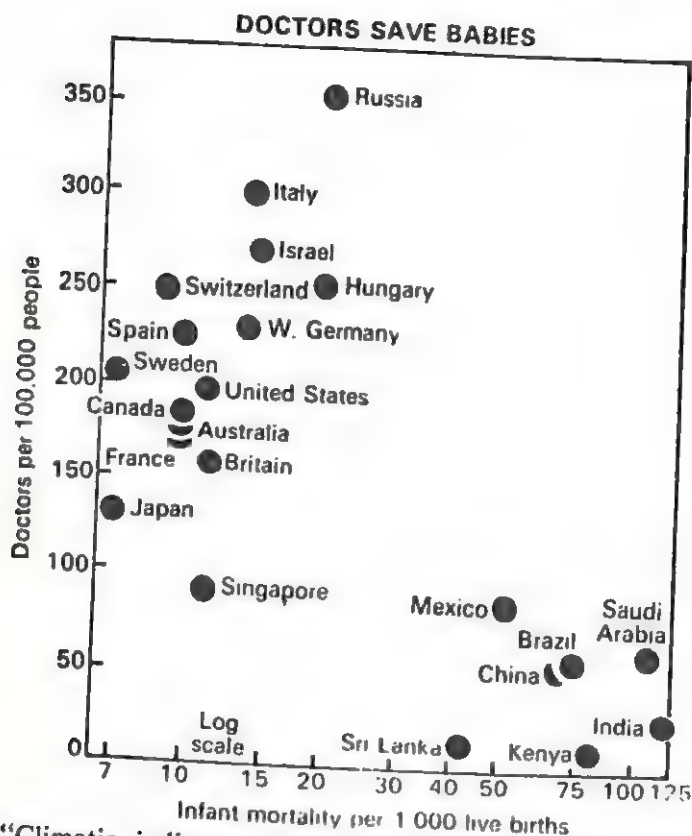
"Climatic indicators" such as mean average monthly temperature, temperature range and annual rainfall are shown in the following table which is compiled for 23 countries of the world.

TABLE 5

Climatic Indicators

1	Mean average monthly temperature F°	Temperature range* F°	Annual rainfall, inches
	2	3	4
USA	57	43	41.9
Japan	58	41	61.6
W. Germany	51	34	26.6

1	2	3	4
France	53	29	24.4
Britain	50	24	23.3
Italy	61	31	29.3
Canada	42	57	34.3
Australia	56	26	23.0
Sweden	44	38	21.8
Spain	57	34	17.5
Switzerland	50	35	42.9
Saudi Arabia	77	35	3.2
Israel	63	28	20.8
Kenya	65	6	37.7
Russia	40	55	24.6
Hungary	52	35	24.2
Mexico	61	12	29.4
Brazil	73	10	42.6
Bahamas	77	12	52.8
Singapore	81	3	94.9
India	77	35	25.2
China	61	42	44.7
Sri Lanka	81	4	93.1

Notes: *Difference between average hottest and average coldest month. Day
temperature only

Source: UK Met Office

"Political indicators" include central government expendi-
ture as a percentage of GDP, public sector employment as a
percentage of labour force, defence expenditure, number of
women MPs and number of government heads are shown in the
following table for 23 countries of the world, including highly
developed, developed and less-developed countries of the world.
The table is self-explanatory in nature.

TABLE 6

Political Indicators

	Central government expenditure as % of gdp 1981†	Public sector employ-ment as % of labour force 1981‡	Defence expendi-ture as % of gdp 1980	Women MPs as % of all MPs‡	Number of govern-ment heads since end 1963
USA	18.1	16.5	4.9	4.8	5
Japan	10.1	6.6	1.0	1.8	8
W. Germany	20.7	15.2	2.7	9.8	5
France	15.8	15.8	2.8	5.7	4
Britain	22.3	22.8	4.6	3.6	5
Italy	18.1	15.2	1.6	7.9	9
Canada	19.5	18.9	1.8	5.7	3
Australia	17.1	25.2	2.3	4.8	7
Sweden	29.3	31.4	3.2	28.0	4
Spain	11.8	12.6	1.3	4.6	6
Switzerland	12.5	10.2	2.0	11.0	20
Saudi Arabia	19.5	20.0*	0*	0*	3
Israel	33.6	25.0*	31.2	6.7	5
Kenya	19.5	8.0*	4.4	0.6	2
Russia	45.0*	100.0	13.0*	32.5	3
Hungary	40.0*	80.0*	2.0*	30.0	4
Mexico	11.7	10.0*	0.4	11.5	5
Brazil	8.9	10.0*	0.7	1.9	7
Bahamas	13.2	15.4	0.0*	7.7	1††
Singapore	10.2	8.0*	5.5	0	1
India	10.3	5.4	2.8	6.3	4
China	45.0*	30·0*	4.6	21.2	2
Sri Lanka	8.3	21.5	1.5*	3.0	5

Notes: *Guessimate, †or latest available year, ††since independence in 1973, ‡or equivalent in the lower chamber (latest).

Source: OECD national sources. Guinness book of kings, rules and statesmen.

APPENDIX

Population of India: Features and Trends

In the historical past, the population of India was much smaller than what it is today. The course of population growth in India, as the censuses show, passed through distinct phases. The first population census in India was held in 1872. A systematic study of demographic situations in India was, therefore, possible only from this time onwards. The history of population growth in India can be broadly divided into two parts:

(i)   The pre-1921 period of slow but fluctuating growth.

(ii) The post-1921 period of rapid population growth.

The growth of population from 1871 to 1981 is shown in the following table:

Population of India

Year	Population (Million)
1871	208.0 (Undivided India)
1881	256.0
1891	235.9
1901	235.5
1911	249.0
1921	248.1
1931	275.5
1941	312.8
1951	356.8
1961	439.0
1971	556.0
1981	683.8

The table shows that the rate of growth of population was moderate and irregular till 1921. During 1891-1900, the rate of growth of population was only 1.5 per cent. During the last quarter of the 19th century, severe famines affected many parts of the country. The famine of 1896-97 caused a mortality of 7.5 lakhs in British India alone. The famine of 1899-1900, along with epidemics, caused a mortality of 10 lakhs. There was a servere famine in South India during 1876-78; and during 1891-1901, famine and plague joined hands to check the growth of population. During 1901-1911, population increased by 6.7 per cent. This period was the period of moderate agricultural prosperity, but malaria and plague caused heavy loss of life. In the period 1911-21, the rate of growth of population was only 0.9 per cent. This was due to the great influenza epidemic which caused a loss of 14 million lives.

From 1921, the turning point in population history started. 1921 was a 'Great Divide'. During 1921-31, the population increased by 10 per cent; and in 1931-41 by 15 per cent. Between 1921-61, the population increased by 19 crores in spite of war, Bengal famine and partition. From 1941-51, the population increased by 1.4 per cent per year, in 1951-61, 2.15 per cent per year and in 1961-71, 2.5 per cent per year.

The rapid growth of population after 1921 is due to the following main factors:

(1) Transport and communication improved. This prevented large-scale famine mortality.
(2) Universal and early marriage and reduction in widowhood.
(3) Natural calamities, diseases, etc. were brought under control more or less.
(4) Welfare, health and medical facilities improved. This reduced the death rate, thereby causing rapid growth of population. Infant and maternal mortality declined rapidly.
(5) Culture is fertility-oriented. Paternity is glorified. Barren people face social opposition and contempt.
(6) Poverty and ignorance of the people are responsible for rapid growth of population.

Birth and Death Rates

In India, the death rate remained very high and erratic till 1921, but it showed a continuous decline in later years. The birth rate showed a uniformly high level till 1941, but declined a little bit thereafter (vide table infra):

Birth and Death Rates (per 1000 population)

Year	Birth rate	Infant mortality	Death rate
1881-1891	48.9	—	41.3
1891-1900	45.8	—	44.4
1901-1910	48.1	—	42.6
1911-1920	49.2	267 (1918)	48.6
1921-1930	46.4	146 (1947)	36.3
1931-1940	45.2	—	31.2
1941-1950	39.9	—	27.4
1951-1968	41.7	—	22.8
1969-1971	37.0	140 (1971)	16.0
1971-1981	36.0	121 (1981)	14.8

Infant mortality in India

India has a higher infant mortality rate than that of any developed country of the world. The infant mortality rates in Sweden, New Zealand and Holland were 20, 22 and 22 (per thousand) respectively in 1951. The infant mortality in India was 183 per thousand in 1951, and this fell to 140 per 1000 in 1971. In India, there have been wide fluctuations in infant mortality rates ranging from 267 in 1918 to 129 in 1981. During the early years of the 20th century, high infant mortality was due to famine, malaria epidemic and influenza. The decline in infant mortality in recent years is due to the improvements in environmental hygiene and expansion of maternal and child welfare services. The rate of infant mortality is not uniform throughout the country. It is 124 for Andhra Pradesh, 119 for Punjab, 117 for Tamil Nadu, 105 for U.P., 86 for Karnataka, 39 in Tripura, 41 in Kerala, 77 in Himachal

Pradesh and 79 in Delhi. The infant mortality rate is high in the industrial centres and over-crowded areas.

The infant mortality rate is very high in India. Nearly one-ninth of the babies born die before they are one year old. According to Prof. Chandrashekhar, the reasons behind the enormous wastage of infant life in India are diseases and pre-natal and natal influences, carelessness, malnutrition and the like[1]. Over 40 per cent of the deaths of infants occur in the first week after birth and over 60 per cent in the first month. By the 5th birthday, 40 per cent of those born are claimed by some fatal disease or the other, and by the 20th birthday, only 50 per cent are left, and by the 60th birthday, only 15 per cent survive. However, due to better public health facilities and improvement in medical science, infant mortality is gradually decreasing in India.

Age Composition of the Indian Population

According to the 1971 census, children falling in the age group 0-14 years were 42 per cent of the population. The number in age group 15-59 constituted 52 per cent. Old people above 60 years were 6 per cent of the total population. In the advanced countries the proportion of children in the total population ranges between 20-25 per cent. But the proportion of children in India's population is very high. This is mainly due to a very high birth rate and decline in infant mortality. The large proportion of children in the population means a large number of unproductive consumers; and this constitutes a heavy burden on the working population.

According to Prof. Sandburg, a population with about 40 per cent children is indicative of a fast rising population. A large number of children in the population is harmful for several reasons:

(i) It increases the dependency load.
(ii) It leads to a diversion of resources from capital forma-tion to unproductive consumption.
(iii) It results in exploitation of child workers, and under-employment.

1. S. Chandrashekhar, *Population and Planned Parenthood in India.*

All these show that there is a tremendous loss of economic power and capital formation in the country. There is an enormous wastage of life in India. With a large proportion of very young people, it is but natural that India should have a high infant mortality rate. The average length of life is very low in India—nearly 53 years; whereas it is nearly 70 years in advanced countries.

Distribution of Population

In India, the northern regions contains 15 per cent of the total population, eastern India 25 per cent, southern India 21 per cent, central India 15 per cent, Western India 11 per cent and north-west India 10 per cent. U.P. has 883.4 lakh population, West Bengal 443.1 lakhs, Tamil Nadu 411.9 lakhs, Rajasthan 257.6 lakhs, Punjab 135.5 lakhs, Maharashtra 504.1 lakhs, M.P. 416.5 lakhs, Meghalaya 10.1 lakhs, and Nagaland 5.1 lakhs population. States like U.P. and Bihar have 8.8 crores and 5.6 crores population respectively whereas states like Himachal Pradesh and Nagaland have 35 lakhs and 5 lakhs population respectively.

Working Population and Occupation Pattern

The relatively smaller percentage of population in the age group 15-64 implies that the Indian economy has a lower ratio of working population to non-working population. This is evident in the following table. This shows that while the total population in India increased by 50 per cent during 1901-51, the working force increased by only 21 per cent. The working force was reduced in 1971.

Year	Working force (cr.)	Working force as per cent of total population
1901	11.14	46.61
1911	12.11	48.07
1921	11.79	46.92
1931	12.96	43.03
1951	13.95	39.10
1961	18.84	42.98
1971	18.36	38.40
1981	29.30	33.40

The occupation pattern in India today has remained more or less the same as compared to 1901. This is shown in the table below:

Occupation Pattern (per cent)

Category	Primary occupations	Secondary occupations	Tertiary occupations
1901	71.47	11.70	16.83
1911	74.96	10.77	14.27
1921	76.12	9.96	13.82
1931	74.74	10.25	15.01
1951	74.40	10.56	15.04
1961	76.44	10.96	12.60
1971	72.0	12.0	16.0
1981	69.0	13.0	18.1

Density of Population in India

According to the 1971 census, the average density of population in India is 178 per square kilometre. The population is growing rapidly but the land area has remained almost stable. Therefore, the density is increasing. The density of population was 82 in 1911, 103 in 1941, 117 in 1951 and 142 in 1961. Thus, in the last 60 years the density of population has increased more than two-fold. The largest increase occurred during 1961-71 when it rose by 25.4 per cent.

However, the density of population is uneven in different parts of India. According to the 1971 census, the density per square kilometre is 2,738 in Delhi, 2,257 in Chandigarh, 549 in Kerala, 504 in West Bengal, 324 in Bihar, 300 in U.P., 141 in Orissa, 94 in M.P., 75 in Rajasthan, 31 in Nagaland and 14 in Andaman and Nicobar islands. Even within a state, there are large differences in density. These differences are mainly due to the differences in natural resources, industrialisation, climate, rainfall, irrigation, security, mineral resources, transport, accommodation and other facilities. In Northern India, land is very

productive and the density is therefore high. In Rajasthan, density is low because of sandy soil and water scarcity. In Jammu and Kashmir, density is low because of mountainous areas. In Maharashtra, the low density is due to rocky land. Different rates of urbanisation in India are responsible for density differences. Big cities have attracted more people. In other places, factors like religious and historical importance have increased the density of population. The regions which have a higher rate of industrialisation and trade have generally higher density of population.

India's density of population is 178, whereas it is 319 in the Netherlands, 268 in Japan, 228 in England, 104 in Poland, 79 in China, 22 in USA and 11 in USSR. In absolute terms, India's density of population does not indicate overpopulation. But since the land is not very productive and industrialisation is not very rapid, India at the present stage of development, seems to be overpopulated. Agricultural and industrial revolutions in a country like India will make it capable of economically supporting the density which it has at present. It must be noted that overpopulation is a relative term, and density of population is too crude a measure to establish overpopulation.

The density of population (per square kilometre) in India has been very rapidly increasing as is evident from the following table:

Density of Population (9 per square kilometre)

Year	1921	1931	1941	1951	1961	1971	1981
Density	81	90	103	117	142	178	221

Sex Composition (Sex Ratio/Sex Disparity In India)

In India the sex ratio is generally calculated as the number of females per 1000 males. In the 1971 Census, the sex ratio of India was calculated to be 930. In western countries, the number of females is larger than the number of males. The sex composition in India was 972 in 1901, 950 in 1931, 946 in 1951

and 930 in 1971. Sex disparity is found in different parts of the country. The sex ratio is 1016 in Kerala, 988 in Orissa, 978 in Tamil Nadu, 865 in Punjab, 867 in Haryana, 879 in U.P. and 891 in West Bengal. The average for females in Gujarat, Maharashtra, M.P. and Rajasthan is close to the country's average sex ratio, i.e. 930. In 1971 the sex ratio in the urban areas was 859; in the rural areas it was 952. One very important reason for this difference may be that the males go out of villages to work in cities, leaving their women folk in the rural areas.

In India, the number of males is greater than the number of females. The sex ratio in India is continuously decreasing. This is due to many factors, e.g., comparative neglect of girls, child marriage and high death rate of women in the reproductive age, etc.

Sex Ratio

Year	1901	1921	1931	1941	1951	1961	1971	1981
Females per 1000 males	972	955	950	945	946	941	932	935

Rural-Urban Composition of Population In India

According to the 1971 census, out of the total population of 54.8 crores, as many as 43.9 crores lived in villages, and only 10.9 crores lived in cities and towns. This means that about 80 per cent of India's population is rural and 20 per cent is urban. But the proportion of the urban population has very much increased in recent years.

About half of the urban population in India is concentrated in a few big cities with a population of one lakh or more, and the population of those cities is growing at a fast rate. These cities are centres of industries, trade, transport, administration and other services. It is these factors that have led to the concentration of the urban population in these cities.

Andhra Pradesh, West Bangal, Tamil Nadu, Punjab, Haryana, Bihar and Kerala have large average village populations compared to Rajasthan, H.P., Assam, M.P. or Orissa. Large villages are more frequent in the fertile areas of Haryana, Punjab, U.P. Bihar and in river valleys; and small scattered hamlets are found on the Himalayan slopes, Deccan plateau and in the desert area of Rajasthan. The states with a greater percentage of rural population are Orissa, Assam, H.P. and Bihar. The states of West Bengal, Karnataka, Tamil Nadu, Punjab Rajasthan and Kerala are less rural. The urban rural ratio of population was 1:8.2 in 1901 in India, 1:72 in 1931, 1:48 in 1951, and 1:4 in 1971. This means that the ratio of rural to urban population has come down gradually. The rate of increase of population in urban areas has been higher than that in the rural areas during the last few decades.

The percentage of urban population in India has been increasing, while the percentage of rural population has been decreasing. This is given in the following table:

Rural and Urban Population (per cent)

Year	1921	1931	1941	1951	1961	1971	1981
Rural	88.6	87.9	86.1	82.7	82.2	80.1	76.3
Urban	11.4	12.1	13.9	17.3	17.8	19.9	23.7

Literacy

Literacy has been increasing in India (vide table below)

Literacy (Per cent of Population)

1951	1961	1971	1981
16.7	24	29.46	36.17

Expectation of Life in India

The number of years for which the people of a country expect to live at the time of birth is the average life expectancy

of that country. Life expectancy depends mainly on the death rate and the age at the time of death. If the death rate is high, and/or death occurs at an early age, the life expectancy would be low. On the other hand, if the death rate is low, and/or death occurs at a late age, the life expectancy would be high. During the period 1901-1910, life expectancy was only 23 years. It started rising slowly after 1921. Life expectancy was 32 years in 1951, 41 years in 1961 and 53 years in 1971.

However, as compared to many countries, life expectancy in India is very low, e.g. life expectancy in the USA, Japan and Australia is 70 years, and in England it is 71 years. A lower life expectancy indicates economic backwardness and adversely affects economic growth. The investment made in working after and educating people cannot be fully fruitful if death occurs at an early age. Shorter life expectancy decreases capital formation, working force and demand. The relatively low life expectancy of the Indian population is due to the following causes:

(1) Hot climate in the country,
(2) Lack of public health, and insufficient medical facilities,
(3) Prevalence of epidemics,
(4) Shortage of pure drinking water,
(5) Shortage of nutritional food,
(6) Poverty and low standard of living,
(7) Ignorance, superstition and unhealthy social habits,
(8) High death rate of women at the time of child-birth, and
(9) High rate of infant mortality.

During the normal years, the death rate has been consistently high because of the lack of public sanitation and hygiene, and widespread malnutrition and undernutrition of the people. In India, the death rate is about 16 per thousand per year. Nearly 10 million die every year. The death rate is high among the infants, women in child-birth and women in the reproductive age groups. Infant mortality is also high due to diseases, pre-natal and natal influences, low vitality and the like. Maternal mortality is also very high in India. It is 23.5 per 1000

births. More than 2 lakh mothers die every year due to child-birth problems.

The death rate is the decisive factor in Indian demography. During the last few decades, the expectation of life has increased considerably due to improvements in public health measures and medical facilities, which have resulted in lower death rate in general and, lower infant mortality in particular.

In 1961, the expectation of life was 41 years, but in 1971 it became 53 years. But, compared to many countries, life expectation in India is very low. It was 54 years in 1981.

Religious Composition of Population

In the Indian population, Hindus predominate, followed by Muslims and Christians (vide table below).

Religious Composition of Population (%)

Religions	1961	1971	1981
Hindus	83.51	82.72	
Muslims	10.70	11.21	
Christians	2.44	2.60	
Sikhs	1.79	1.89	
Buddhists	0.73	0.70	
Jains	0.46	0.47	
Others	0.37	0.41	

Urbanisation in India

In India, the trend towards urbanisation started in the 19th century. Famines, partition of the country, railway construction, epidemics, decay of handicrafts, growth of new industries, trade and commerce, the creation of a landless labour class, settlement of landlords in towns, and backwardness of villages were responsible for urbanisation in India. But the process of urbanisation was very slow in India in the past. More investment was made on the rural sector, and investment in construction and housing in cities has not been substantial. But still, a

few statistics will support the trend towards urbanisation in India.

In the 50 years between 1921-71, whereas the urban population increased 4 times, the rural population had only doubled itself. The proportion of the urban population has increased from 11 per cent in 1921 to about 20 per cent in 1971. This means that out of every 5 Indians, 1 lives in a town; 50 years ago, for every 9 Indians, 1 was an urbanite. The unadjusted growth rate of urbanisation was 26.4 per cent for the decade 1951-61. However, there was wide variation in state growth rates, which ranged between 9.9 per cent for U.P., and 122.5 per cent for Assam.

In the 1971 census, the definition of the urban area was as follows:

(1) All places with a municipality, corporation or cantonment or notified area town, or

(2) A minimum population of 5000 in an area.

(3) The area where at least 75 per cent of the male working population is non-agricultural, or

(4) An area having a density of population of at least 400 per square kilometre.

The urban population has grown in absolute terms from a figure of 26 million in 1901 to 109 million in 1971. In relative terms, the ratio of rural population to urban population has come down from 8.2:1 in 1901 to 4.0:1 in 1971. The proportion of the urban population in class I towns with a population of over 1 lakh has increased from 22.9 per cent in 1901 to 52.4 per cent in 1971. This shows that there is a trend towards concentration of population in the bigger towns. But the population in class II and III towns has remained almost constant, whereas the relative proportion in class IV, V and class VI towns, has come down sharply. There are eight large cities in India, each with a population of over 10 lakhs.

Metropolitan towns are growing at a much faster rate than the normal growth of population in India. Whereas in India 19.9 per cent of the population lives in urban areas, it is 73.6 per cent for Canada, 59.9 per cent for the USA and 55.8 per

cent for USSR. In foreign countries urbanisation was the consequence of large scale production, growth of industrial civilisation and the introduction of machinery.

There seems to be a positive correlation between the degree of urbanisation and the per capita income. A higher per capita income tends to be correlated with a higher percentage of urban population to the total population. A high degree of urbanisation is found in states like Maharashtra, Tamil Nadu, Gujarat, and West Bengal. These states received a large number of public sector projects and other industrial projects of national importance. These states are also important for the development of overseas trade on account of their ports. But industrialisation in India has not been able to significantly absorb the rural population. Therefore, the migration from the rural to the urban areas is not conspicuous.

There are however, more people in towns than jobs, education, medical and accommodation facilities and the like. The pace of urbanisation is faster than the rate of industrialisation and the rate at which other facilities are expanding. Urban areas in India have many problems, such as unemployment, slums, violence, etc. Thus, to cope with the problems of the urban areas, measures are required in at least three directions:

(1) Efforts should be made to expand and improve the facilities relating to education, health, medical services and housing in towns.

(2) Living conditions in the rural areas should be improved. Drinking water, medical and health services, electricity and elementary education should be made available in rural areas in the shortest possible time to reduce the attraction of towns.

(3) New, small industrial townships should grow near the rural areas; from such towns ideas and improved practices can be spread over the rural areas.

In this way, pressure on big cities can be avoided. In a country like India, a large number of medium-sized cities should be more helpful than a small number of very large

cities.   What is required is the ruralisation of urban areas, and urbanisation of rural areas.

Urbanisation in India has been progressing at a slow but steady rate. The number of towns along with population are shown below:

Towns with population	Nos in 1961	Nos. in 1971	Nos. in 1981
Population less than 5,000	218	277	230
Between 5,000 and 10,000	760	756	742
Between 10,000 and 20,000	748	931	1048
Between 20,000 and 50,000	484	617	730
Between 50,000 and 1,00,000	139	198	270
1,00,000 and above	113	142	216
Total	2,462	2,921	3,245

Future Trend

If the present trend countinues, India's population would be abnormally high in future. Economists, sociologists and demographers have made various projections about India's future population.

The Expert Committee on vital Statistics projected birth and death rates in India between 1976 and 1981 to be of the order of 28.7 and 9.2 respectively. U.S. President Johnson's Science Advisory Committee projected that in 1985, India's populationn would be 18 per cent of the world population. The rate of growth of population would go up to 2.7 per cent. Then, gradually, the rate of growth of population would decline. In India, 1.75 crores additional people were added per year between 1965 and 1985; and between 1985-2000, per year 2.67 crores people would be added to the existing population. The Planning Commission of India projected that at the end of 1980-81 the birth-rate would come down to 26 per 1000 and death rate, 9 per 1000 and, after 1980-81, the rate of growth of

population would be 1.2 per cent per year. A few projections regarding India's population are given below:

(*in million*)

Authorities Projecting	1981	2000	2001
Kingsley Davis I	492		648
II	427		459
III	476		521
Registrar General I	528		
II	535		
Coale and Hoover I	662		
II	641		
III	588		
S.N. Agarwal	628		788
Expert Committee I	723		
II	693		
III	666		
Science Advisory Committee (Johnson)		1240	
Planning Commission		870	
Dr. S. Chandrashekar		1000	
Eastern Economist	657		

However, for a number of reasons, population projections are very difficult and uncertain. Very recently, the population control policy and family planning are being pursued with great zeal and vigour. Upto the end of 1984, 19 million sterilisation operations have been performed, and the birth rate has been showing a steady decline. If this trend continues, most of the aforesaid projections will prove to be wrong, and the population picture will not be so alarming. It is interesting to note that none of the projections has come true.

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MODERN POLITICAL GEOGRAPHY OF INDIA
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